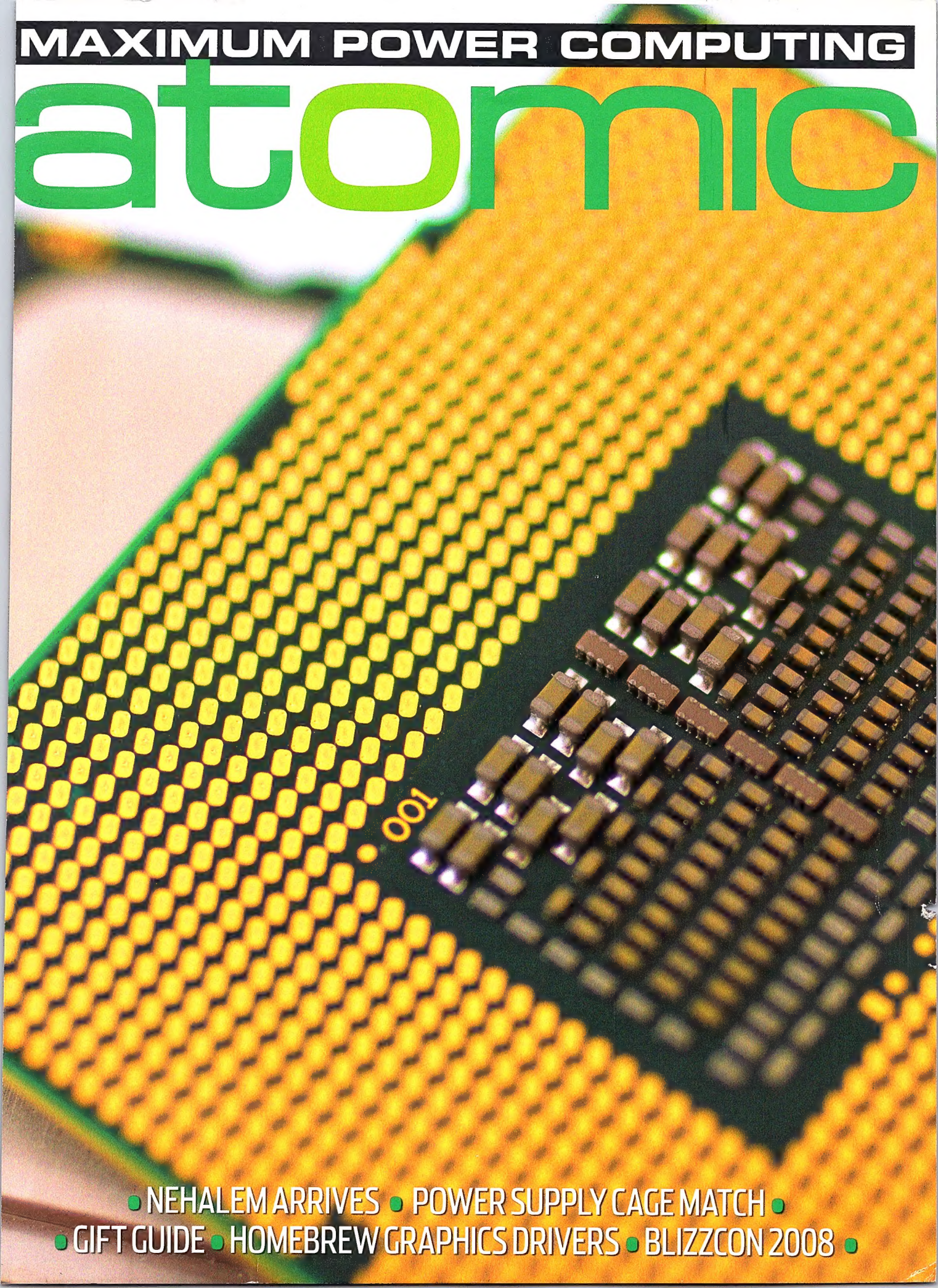
MAXIMUM POWER COMPUTING

atomic



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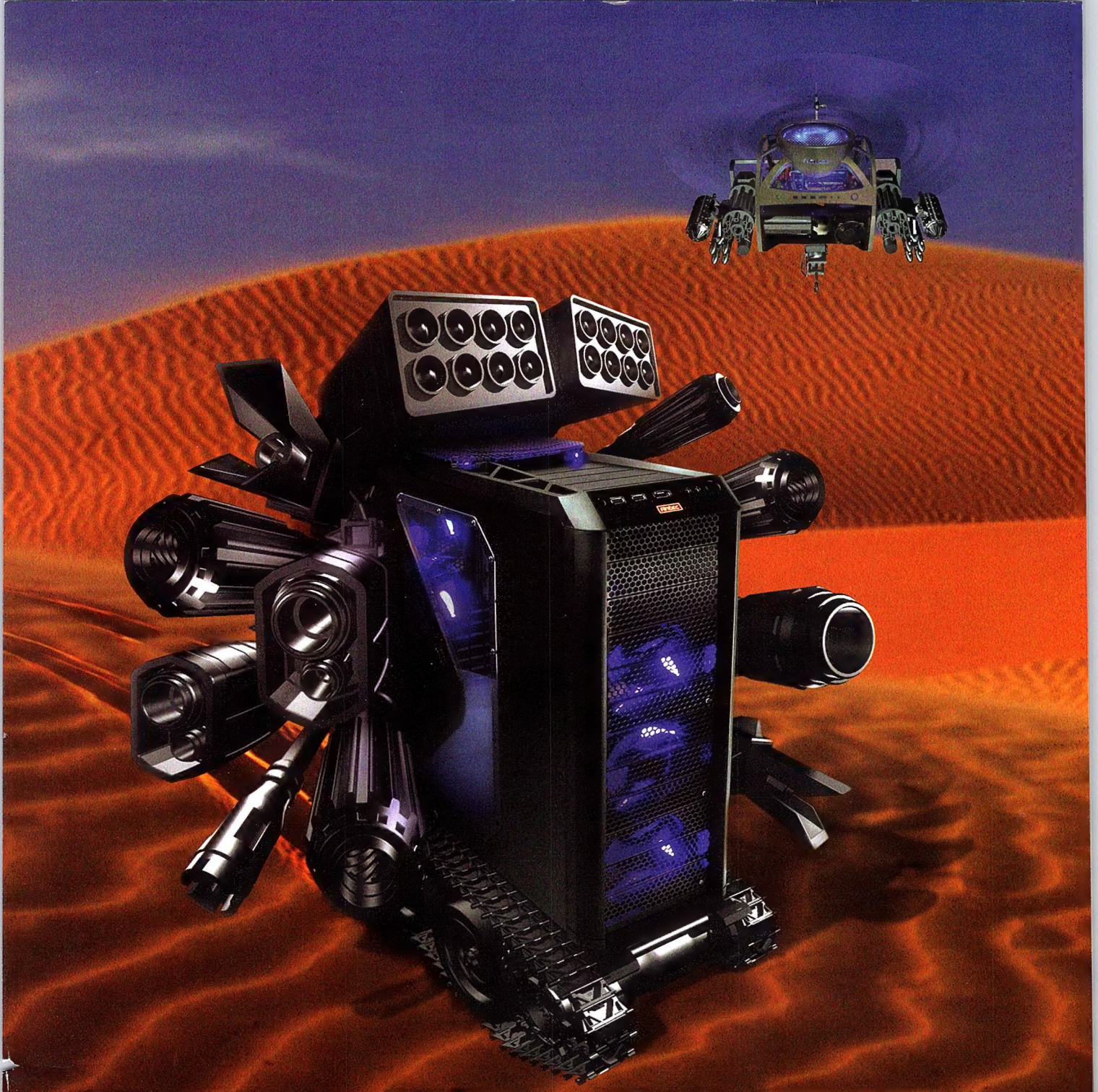

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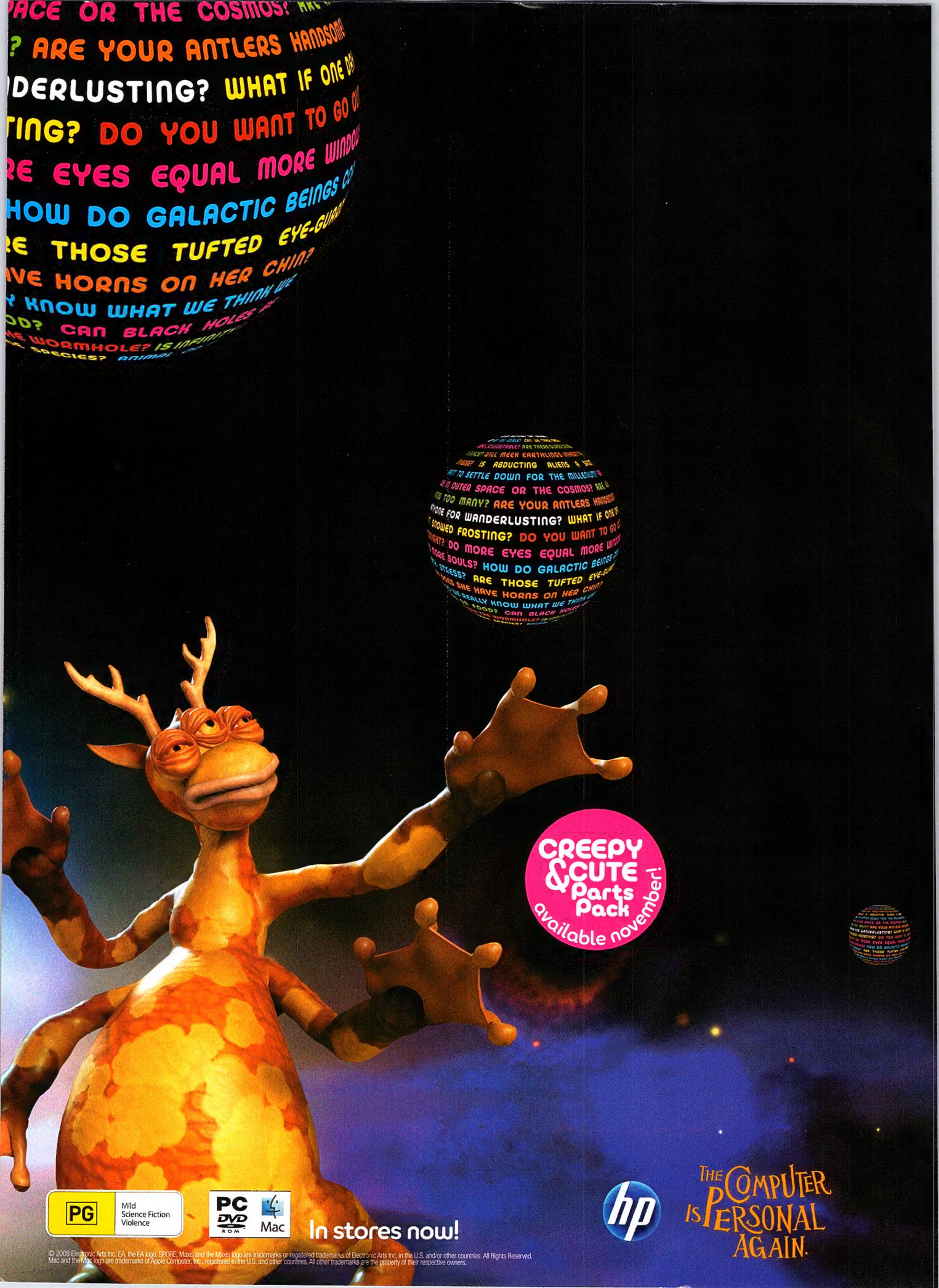
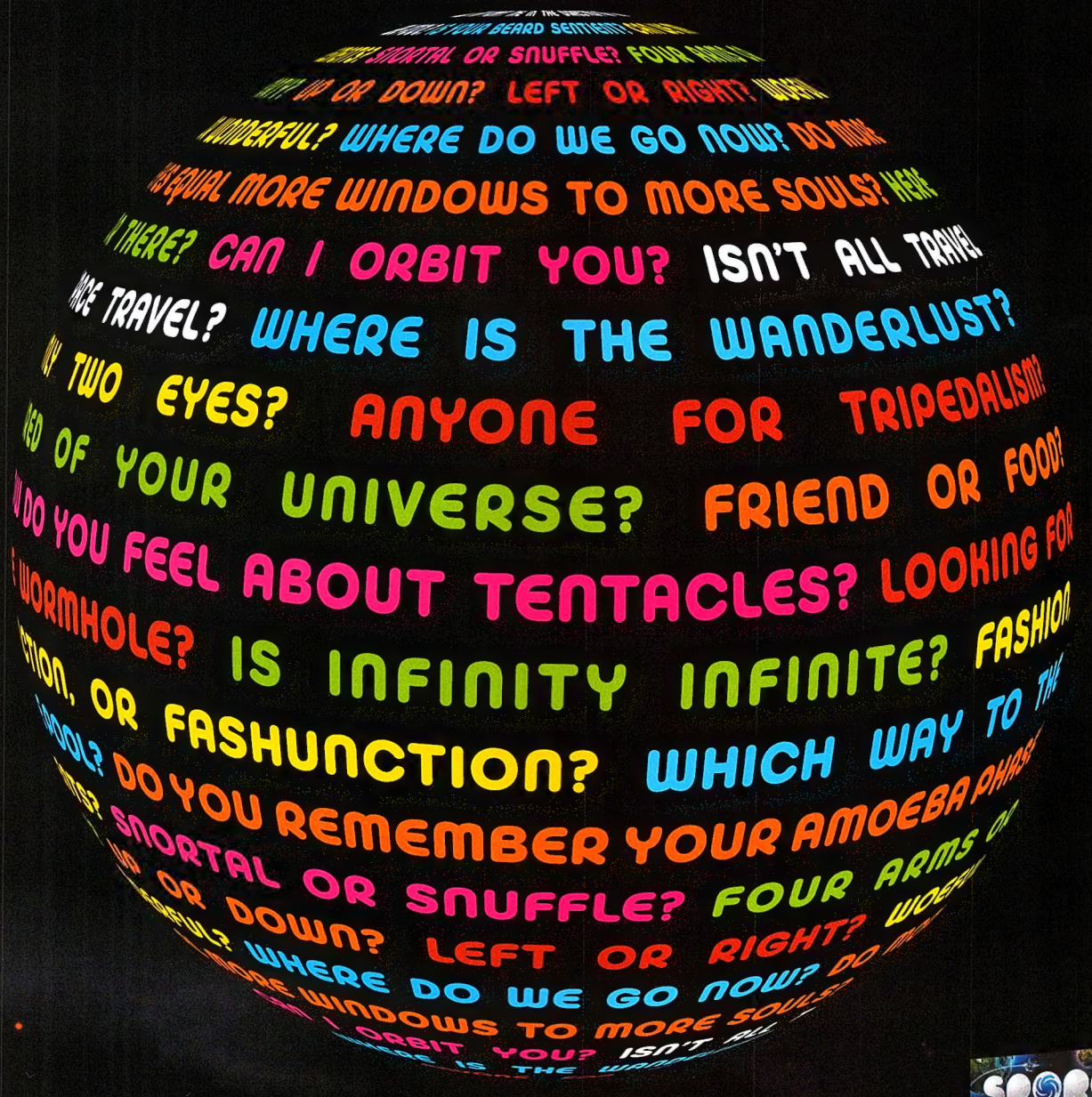


SPORE

HOW WILL YOU CREATE THE UNIVERSE?



EASPREATM1

www.electronicarts.com.au

EA MAXIS

EDHEAD

It's here!

I can hardly believe it. Nehalem... is here.

Not only here, but I've let slip the tech writers of war (well, Justin, actually) to work the Intel's newest performance chip to within an inch of its silicon life. The results? Well, I don't want to engage in any spoilery activity, but I think I can safely say you'll be impressed. We certainly are, and everyone in the office is currently working out what organs they can live without in order get one of the Extreme ones.

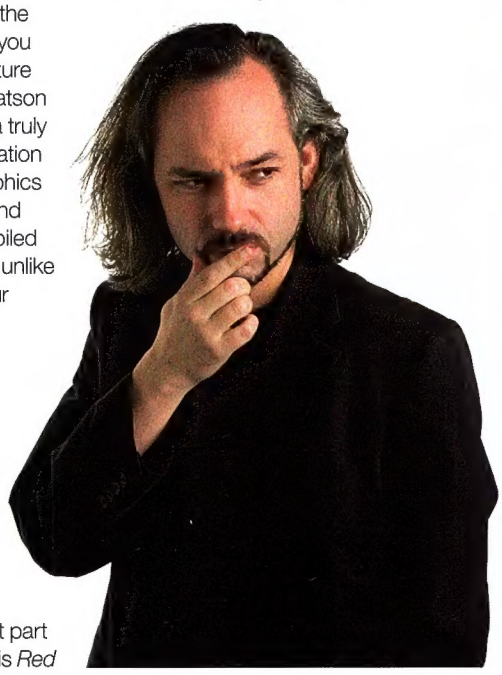
Because, you know, we need that much performance. To live. Oh! And we're giving a lucky new subscriber the chance to win a Nehalem chip all of their lucky own. Imagine that... it could be in your home machine before it's in ours!

Now, if – like us – performance is the be-all and end-all of computing life, you might also be curious about our feature this month. My main man James Matson has put on his gumshoe outfit and a truly terrible Humphrey Bogart impersonation to get all the dirt on home brew graphics drivers. Can these highly tweaked and seriously streamlined drivers – compiled as acts of love by serious geeks not unlike you and I – make a difference to your gaming experience? James knows.

In fact, there are many answers this issue, from our comprehensive round-up and exploration of power supplies and how they work (or don't, as we found out in many cases, thanks to the insanity that is Big Willy). We've also got the answer to what you can do to extend Windows Home Server into the ultimate media and data storage system – or, at least, the first part of a rather large answer. How good is *Red Alert 3*, *Far Cry 2* and the *Crysis* expansion. Hell, the only non sequel we have this month is *Dead Space*, the sequel to which could easily be called *Dead Space 2: This Time Bring More Pants to Shit in*.

And, finally, we answer the important question... How cool was Atomic LIVE? We've got a special section highlighting the day for you share. The friendly faces, the near endless prizes, and the wonder of competitive gaming that was the ASUS World GameMaster Tournament.

I certainly had a great time catching up with some of the magazine's most passionate fans, and if you weren't able to come out guide – packed with photos – is the next best thing to being there.



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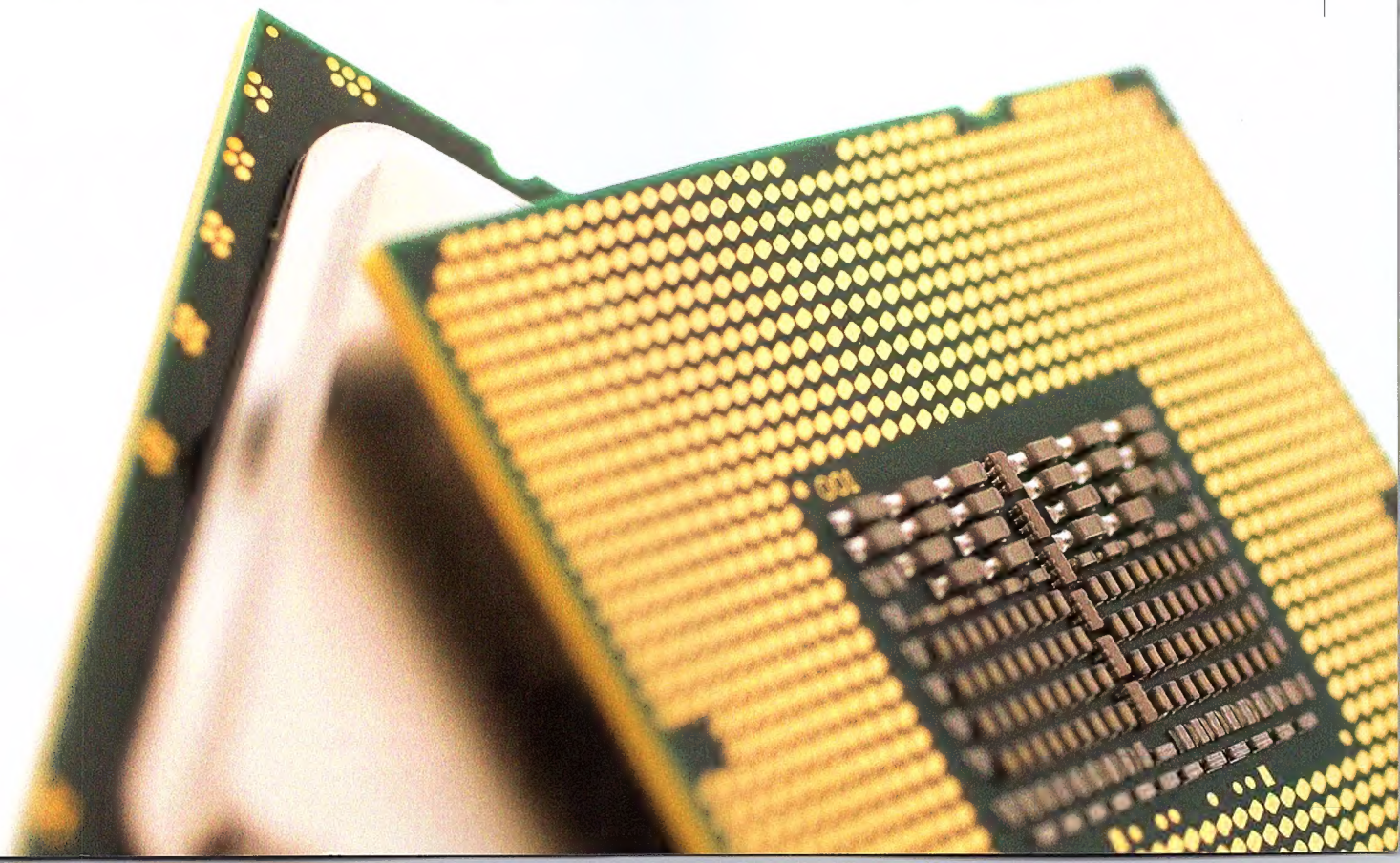
December



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The new GPGPU on the block

S3 on the *virge* of something new. See what we did there?

Thanks to the duopolistic nature of the GPU market it's easy to forget there are any other companies out there tinkering with graphics tech besides NVIDIA and ATI. S3, makers of the S3 Trio, ViRGE, ProSavage and other GPU products has re-surfaced to announce it's ushering new GPGPU technology into the ATI- and NVIDIA-dominated market, hoping the world will get as excited about it as S3 already is.

According to S3 it did a complete re-design and overhaul of the Chrome general purpose programmable shader architecture in its DX10.1 Chrome 400-series chips. To demonstrate the GPGPU tech S3 has released 'S3FotoPro', an application for touching up digital photos that benefits from accelerated calculations when used in conjunction with an S3 GPU. The investment in GPGPU architecture will hopefully prove at least moderately successful, because lets face it, the GPU arena could really use the shake-up of a third party on the scene.

XGI, where are you now?

Big fat Warhammer patch

Things that make you go WAAAGH!

With a gigantic World of Warcraft patch just behind us, Mythic CEO Mark Jacobs has announced a similar big content release via patch for *Warhammer Online: Age of Reckoning* due this December, and let's face it, the best content of all is free content.

There will be stacks of gameplay tweaks, bug fixes and minor additions to the artwork and environment, but the big news is that the patch will deliver two entirely new classes to the game, the Knight of the Blazing Sun and the Black Guard. Technically, they're not new but rather classes which were cut from the original in the pre-launch hacking of Warhammer starting cities and whatnot. But all that nastiness is behind us now, so we'll look forward to December when two tasty tanking classes are unleashed for our gaming pleasure.

SHORT CIRCUITS

There aren't many things that can drive a geek to some sort of tribal towering rage of screaming and rabid foaming but a recent claim by EA game that 99.8 per cent of gamers don't care about DRM is just such a thing. What the hell? It hurts to even write those words, and the claim feels like something that is better suited to the 2008 USA presidential election than the world of gaming. Apparently, according to EA's CEO John Riccitiello, the whole issue of SecuROM and its ilk has been blown 'out of proportion' and 99.8 per cent of users wouldn't notice/don't care. We'd love to find out where EA got its statistics, maybe sit down and have a nice chat in a dark alley, with knives and stabbing weapons close at hand. Just talk mind you, up close, and personal.

Ubisoft is looking – for reasons unknown – to mash all its various Tom Clancy franchises into one big game experience in the near future. Vinh-Dieu Lam, lead programmer on *Tom Clancy's EndWar*, was recently interviewed and let slip the potential for the next *EndWar* to contain not only its own gameplay, but that of *Splinter Cell*, *Ghost Recon* etc. As long as they don't call the new franchise *Advanced Raven Ghost Splinterfighter Cell Shield*, we're OK.

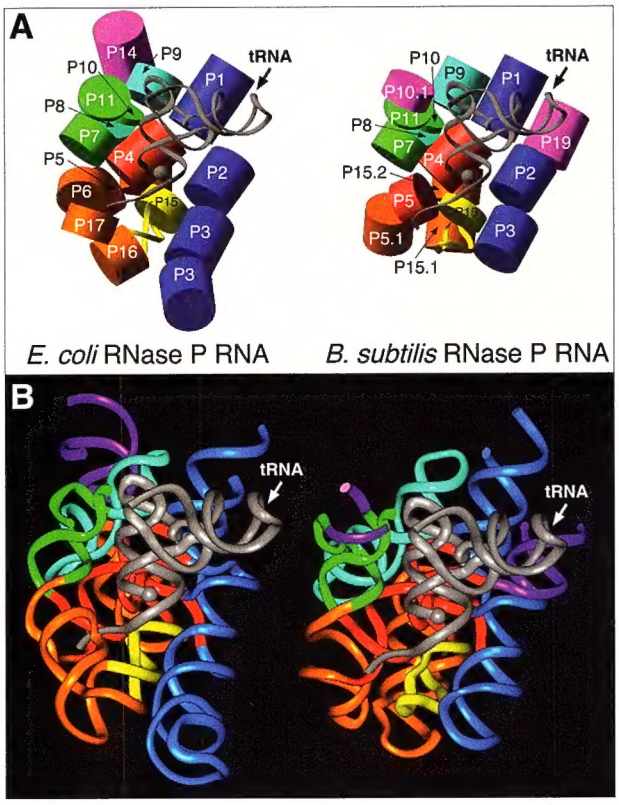
It's alive!

RNA based logic gates? It's even cooler than it sounds!

While you might be familiar – perhaps even comfortable – with the well known double helix of wonder that is DNA, you might not have had much exposure to its close cousin, Ribonucleic acid or 'RNA'. RNA is very similar to DNA, in that they both (along with protein) form the base building blocks of life within a cell, DNA acting as the genetic instruction manual to do just about everything including build RNA while RNA is used for protein synthesis. So far this all sounds like a world away from your SATA cable-laden Coolermaster-housed rig, huh? Maybe for the moment, but thanks to intrepid researchers that love to blur the line between the technological and the biological, the relationship between RNA and the computer sitting on your desk might become a whole lot cosier.

A team at RIKEN Systems and Structural Biology Center in Yokohama Japan have been experimenting with creating logic gates out of RNA itself, representing a purely biological apparatus for interpreting and acting on logic instructions. In electronic terms, a logic gate is a switch that operators on the Boolean logic of true or false, or in the case of a digital circuit, *high voltage* or *low voltage*. It is this very elementary form of logic that allows a machine to function and to act or react depending on different logic scenarios.

Researchers have been able to engineer RNA molecules to contain their own internal 'decision making' logic that allows it to detect the presence of what are termed 'input' molecules and respond by either producing the protein it encodes, or not – on or off, perfectly binary just like your average computer. RNA is well suited to this logic gate role, because unlike DNA, the presence of an oxygen atom in its component sugars makes RNA far more reactive. RNA molecules can twist to form elaborate structures, and particular types are flexible enough that extra RNA can be inserted into the molecule's structure without destroying its integrity or function. With these additional sequences in place the entire molecule acted like a switch.



E. coli RNase P RNA *B. subtilis* RNase P RNA

> "It's the first installation of logic gates for controlling gene expressions in a living cell. It's a wonderful result..."

Researchers were able to control the switch during the experiments but have so far only replicated the function of an AND and OR gate. "It's the first installation of logic gates for controlling gene expression in a living cell," comments Kensaku Sakamoto, an expert in DNA computation at the RIKEN Systems and Structural Biology Center. "It's a wonderful result, and a milestone in the efforts for artificial regulation of living systems."

Now before you go getting all excited that biological logic gates will mean super fast desktop computers that bend Crysis fair over the bed and still have processing power left to run multiple instances of VLC media player, take a step back. Calm down. There is sadly, very little practical application for this technology in desktop computers. There's also very little evidence to suggest that biological logic gates or indeed entire 'circuit boards' have any tangible performance benefit over your standard PCB.

None of that however, changes the fact that this technology is fascinating, geeky, and has the potential to be the shoulders upon which another technology can stand, one that *will* give us our eat-your-children gaming PCs powered by a bunch of RNA logic gates and half a rabbit's brain.

FROM ATOMIC ONLINE

atomic LIVE 2008

LIVE, that lovingly hand crafted and top tier event of tech worship has wrapped up for another great year, and 2008 proved that the event – like a good wine or Amiga games – only gets better with age. People won prizes, saw tech, rubbed shoulders with the Atomic crew and generally carved a smashing corner of geekism into the Sydney showgrounds. Visit http://forums.atomicmpc.com.au for pics, official and un-official writeups of the day and rumours about David Hollingworth's cocaine and hooker antics 'backstage' (I do read this, you imbecile! *–ed*).

World's 1st Super Hybrid Engine Motherboard

Need a top-notch motherboard able to take-on the latest standards for extreme OC performance? Then the new ASUS P6T Deluxe Series is your perfect partner on your OC conquest. Incorporating Intel's latest X58 chipset and supporting the upcoming Intel® Core™ i7 processors (LGA 1366 socket), the P6T Deluxe Series features the ASUS Super Hybrid Engine combining both the TurboV and EPU technologies for twin-powered performance that delivers

Get on the extreme OC adrenalin rush with TurboV, one of the two key features of the Super Hybrid Engine, which for itself stands as an amazing advanced overclocking tool with a micro-controller to fulfill your desires of breaking OC records every time. It provides rich overclocking options on key components. Moreover, with 0.02V micro-intervals adjustments to NB, NB-PCIe, CPU PLL and DRAM voltages, fine-tuning becomes two times more precise. What's best is that you do not have to exit the OS or reboot to execute your OC settings. Likewise, TurboV can unleash the overclocking capability of Intel® Core™ i7 processor Extreme edition by providing easy and real-time CPU multiplier adjustment without rebooting the system to access an immediate CPU upgrade! Another new and useful solution found in the P6T Deluxe Series that caters to different user scenarios while overclocking is the OC Palm - an optional side display that provides real-time OC functions without interrupting current running programs. Plus, you can load your preferred settings into customised profiles for performance boosts with just a simple click.

More energy efficiency for a greener tomorrow

Keeping with the current trend towards power and energy efficiency, the P6T Deluxe Series also utilises the ASUS exclusive EPU technology. This unprecedented feature of the Super Hybrid Engine controls 6 major components: the CPU, VGA card, memory, chipset, hard drives, and the CPU cooler/system fan. Equipped with special fine-tuning settings compatible with the latest Intel CPUs, it can automatically provide the best power management for optimal energy efficiency.

Featuring TurboV, an advanced OC tool with micro-adjustment steps that allows you to set new OC records with real-time super-precise tunings.

★ ★ ★ ★ ★

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GEARBOX SPECIAL XMAS GIFT GUIDE EDITION

All the gear we'd love to see under the Atomic tree.

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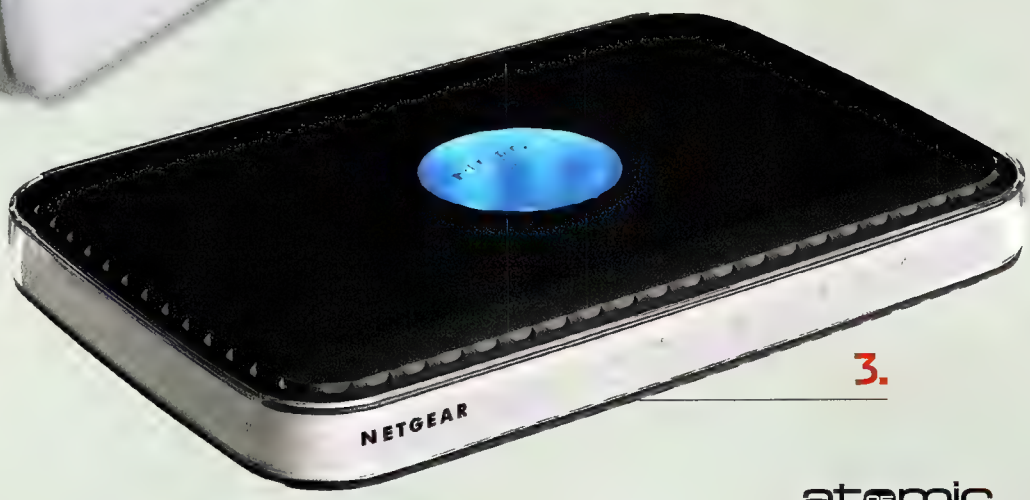

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1. Inwin Na

Price TBC **Website** www.in-win.com.tw

Now here's something you don't see every day. A porcelain hard drive enclosure.

WTF, I hear you say, but bear with me.

The Na is a unique piece of technology, designed as much for style and cultural impact as it is functionality, and it manages to hit on both of those counts. As an enclosure it features a thermostat-rigged 60mm fan to keep the installed drive cool under load, good cable management and rubber mounting to keep vibration to a minimum, along with a either a USB 2.0 or eSATA interface.

On the cultural front, the Chinese porcelain – etched with the Chinese character of the enclosure's name – mimics the same form factor of a calligraphy brush set, and would look great on a more Spartan desktop environment.

Also, being porcelain, it would be the perfect accompaniment to that toilet-based case mod you've always dreamed of.

2. Iomega ScreenPlay HD Multimedia Drive

Price $269 **Website** www.iomega.com

The modern geek's home is strewn with HD content. Whether that be high quality rips of your entire CD collection, downloaded movies (legally downloaded, of course) or reams and reams of digital pr0n, content – now more than ever – is very much king.

But where to store all this, and how to do it in a way that means you indulge whatever format you fancy?

Iomega's answer is simple, and pretty elegant to boot. The Iomega ScreenPlayT HD Multimedia Drive is a 500GB external drive, formatted in NTFS, and with external connections ranging from HDMI to RGB SCART. You can select output to be anything from 480i up to 1080i, and supports all the MPEGs, AC3, WAV, WMA and JPEG – and connects to your PC via USB 2.0. It's your one stop multimedia pit, and is compatible with Vista and XP. And 2000, too, if you're particularly retro.

3. Netgear WNDR3300 dual band router

Price Router $299 Adapter $149 **Website** www.netgear.com.au

Good wireless reliability is like having access to the Force. It binds us together, allows us to reach out around our house or workplace and feel connected to something bigger... maybe even better.

And like how a good Jedi wouldn't be seen dead without his, her or its lightsaber, a good wireless network relies upon a solid router.

The WNDR3300 is just such a device, and it goes one step further by offering dual-band functionality. It takes advantage of both the more standard 2.4GHz range, while letting you also shift up to 5GHz if you've adapters that support it. It's a great choice for those with older adapters but not quite the cash to upgrade all in one go.

And you can even pretend the little blue light is a slicing beam of energy! Well, maybe if your imagination's really good...

4. DataTraveler Terra Cotta USB Drive

Price $69 **Website** www.kingston.com/anz

The humble USB stick is probably one of the most useful things to come out of recent advances in flash memory. Small, reliable, and with ever-growing capacity, they are handy for any number of tasks, from moving data about the home if you're too lazy to get a real network, to making sure you always have vital software with you at all times (Nethack FTW!).

Now, with the DataTraveler Terra Cotta USB 4GB Flash Drive, there's one more string to that very useful bow – style!

Those who find style is just as important as substance will love this etched metal drive, proudly sporting the image of a terracotta warrior. Many drives are light and easy to lose; this one has a pleasing heft that sits well in your hand or pocket, and it's super fast, capable of achieving transfer rates of up to 15MB/second.

5. HTC Touch Diamond

Price $999 **Website** www.htc.com

We know there's another touch capable phone out there on a market right now, one that's so hyped – possibly overly so – that it's almost impossible to avoid. But avoid it you should, because there are better alternatives!

The HTC Touch Diamond is one such, and just about the top of that rarefied heap. It's 2.8in touch screen is encased in a combination of brushed steel and faceted glossy edges, and complete with an elegant user interface. It features a host of applications, from YouTube to Wikipedia, and a built in GPS to keep you from getting lost while you stare lovingly at its gleaming perfection.

And what's more, when you bring this out while surrounded by latte-sipping iPhone fans, they'll all know you for the rugged individualist you really are. Tell them we told you so!

The Lich King Awaits...

You've turned the tide against the demonic evils of Outland. Now the Lich King Arthas has set in motion events that will lead to the extinction of all life on Azeroth. With the undead legions of the Scourge threatening to sweep across the land, you must strike at the heart of the frozen abyss and end the Lich King's reign of terror for all time...

- Battle to Level 80
- Brave the Lich King's domain
- New Death Knight Hero Class
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BLIZZARD ENTERTAINMENT


WORLD of WARCRAFT
WRATH of the LICH KING
IN STORES 14.11.08

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6. CableBox

Price $US29.95 Website www.bluelounge.com

In the wider world, order strives constantly against chaos. Some say it is the ultimate dichotomy that makes up all of reality. For others, the struggle between these two polar views is far simpler.

It's about good cabling.

Chaos = bad. Chaos, in cabling terms, is ugly, and very easily dangerous. Order = good. Ordered cabling represents an ordered mind, and looks far, far better. The CableBox is Order's strongest weapon against the Chaos that is messy power leads and transformers, and a mighty weapon it is, available in black or white and at a reasonable price. Take that One Ring!

7. WD ShareSpace

Price from $749 Website www.westerndigital.com

There once was a time when we were confused about the idea of a SoHo office. They sounded so cool... after all, who wouldn't want an office in a trendy London suburb? But then we found out the truth – small office/home office. How lame?!

But some cool remains, especially when SoHo gear like the WD Sharespace network storage system comes along.

Not only is it ideal for small professional environments, it's also an excellent adjunct to a modern connected home, able to store a metric buttload of data in its four-bay storage system, RAIDed in just about any way you could desire (well, 0, 1 or 5 to be exact). That's up to 4TB of stuff – music, films, donkey pr0n, it's all gravy, baby. Plus you can access remotely via the web, features automatic backup options and email alerts for system health.

And it looks funky. We like that.

8. Bosch 14.4V Cordless Drill Kit

Price $99 Website www.bosch.com

Tools. No, not those tools, the good kind of tools. Ahem.

Tools. We all need them, and as computer enthusiasts and modders we need some pretty awesome ones at that. Something small, easy to use, free of clutter and reliable – yes, that's what a modder needs almost as much as intravenous caffeine and endless inspiration.

And that's just what this cordless drill from Bosch is all about. It features a keyless chuck, two batteries, a one hour charger, kit box and inbuilt light for those hard to see places. You know, like the inside of a custom-cut Lian Li.

Also handy for serial killers.

9. Xbox 360 Wireless Controller

Price $99.95 Website www.xbox.com.au

It's an Xbox 360 controller. It's red. A kind of neat red, too.

Otherwise, if you don't care for the 360, you really don't care about anything I can say to make it sound interesting.

If you do care for the 360, well, you're sold already, and chances are you are quite familiar with the abilities of the wireless controller.

So... it's new, it's red, you want one for Xmas.

Don't say there's no such thing as brevity in tech journalism!

10. Krix Tryptix speakers

Price from $1200 Website www.krix.com

There is sound, which one can amply demonstrate in a textual format by being clever with things like **BOLD** or *italicised* words. But then there is SOUND that goes so far beyond mere typography. Sound like that you get from the Tryptix range of speakers from Krix.

On top of looking the part, these speakers are for sound enthusiasts what a QX9650 is to a computer enthusiast. Terms like 'rich', 'full', or 'sparkling' don't even touch the surface.

Of course, like that 9650, these are very expensive, but if you at all fancy yourself as an AV aficionado, you owe it to yourself to give these a try. It'll change the way you enjoy movies.

Also, the Master Chief has never sounded sexier.

11. FreeAgent XTreme 1TB

Price $TBC **Website** www.seagate.com

It looks like storage is still some kind of mighty, Tokyo stomping buzzword; at least, the amount of MEGA STORAGE options we're seeing hit the marketplace suggest that's the case. 1TB drives, 64GB USB keys, NAS for everyone... OH GOD, WHERE WILL IT END?!?! ARE WE SO GREEDY?

...

Ahem.

Anyhoo, now that my meds have kicked back in, the latest MEGA STORAGE option is courtesy of platterking Seagate, and its FreeAgent XTreme 1TB. It's a rather stylish little unit, all cosy and black, and you simply can't say no to 1TB of storage that you can easily pick and carry around your home. With eSATA connectivity it can deliver 3Gb a second transfer rates... that's of course assuming you have your own eSATA cable, as Seagate has conveniently forgotten to include one. Still, it comes with FireWire and USB cabling, and a little desk rack mount thingy so it can stand up like a little mini person.

12. Teac SB01iDV

Price $749 **Website** www.teac.com.au

Teac may not be the most respected of AV brands, but when we saw this on display at a recent launch event, we were pretty damn impressed at not only the richness of the sound, but also the way it filled the room – and it was a bloody big room!

The SB01iDV (and seriously, guys, we are going to track down the naming people of the world and KILL THEM ALL) boasts 3D sound enhancement that means clear listening no matter where you are in the room, is fully iPod dockable, and features a built in DVD player. It's an odd mix, and we can't think there are many people out there who might be without a DVD player, but if you are... this is a great way to get picture and sound in one handy unit.

13. Linksys WRT610N

Price $349.95 **Wesbite** www.linksys.com.au

While the Netgear router we mention a few pages earlier does the job, you might find it lacking in one important area – raw damn style. The WRT610N (okay, it's not the most stylish name – seriously, naming guys, work on these things a little bit more) is a smooth, darkly curved tech object of desire, and it's pretty neat on the technical front to boot.

It's a dual band model, like the Netgear, but more impressively it can manage both bands at once on the same network. That means you can handle normal data at the slower 2.4GHz spectrum, but still beam HD and similar content around the house via the 5GHz spectrum. Neato! (the 1950's want their word back! *-tech writer*)

It's a bit more expensive, of course, but it's a matter of getting what you pay for.

14. Creative Zen X-Fi

Price $239 **Website** http://au.creative.com/

We like sexy little bits of tech, and the new Zen X-Fi mp3 player pretty much fits that bill exactly. It features a 2.5in screen, and the whole unit is only a little bigger than that – basically, there's enough room for some controls. You can carry it anywhere, and it'll mean you've got a media player, SD card reader, FM radio and voice recorder all in one tiny package. It even features a built in speaker to let you share all your favourite toons and toobs with pals. The included earphones are really quite good, too, making the latest Zen a true pool of entertainment calm.

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Dealing with the revolution

Solid state disks are the next big thing in storage – but are we ready for them? **Ashton Mills** delves into the data to find out.

The limitations of flash

All flash is finite. Just like hard drives too, of course, except hard drives have proven themselves over the years whereas SSDs are so new that no one has used them long enough to say whether they really live up to their lifespan claims or not.

The problem lies in the inherent limitations of the SLC (single-level cell) and MLC (multi-level cell) ICs that make up SSDs – by nature, they have limited erase-write cycles (called an SSD's *endurance*) such that, if the same bits were written over again and again, they eventually fail.

Fortunately, the number of erase-write cycles can be quite large, anywhere from 10,000 to 100,000 depending on the chips being used – SLC can handle up to 100,000 cycles compared to MLC's 10,000. It's also the faster of the two and, naturally, considerably more expensive.

As raw numbers it sounds like quite a lot, especially if you think about how much time is actually spent writing to drives on your machine. However, determining just how long an SSD should last based on these inherent statistics is a little more complicated.

While SSDs will happily read data in relatively fine-grained blocks, the erase-write cycle (a two-stage process, and one of the reasons write performance falls behind read performance) is performed in large blocks ranging from 128k to 1MB. So even if you write a 10k file, up to a hundred times this is erased in the cycle, wearing out a larger segment of the memory than is actually needed.

Then, depending on which vendor you talk to, the equation used to determine an estimated lifespan in years (involving estimated writes, disk volume, wear levelling (see below) and more) can only provide a rough estimate, and says nothing for the actual personal usage scenarios (gaming, P2P, film editing etc). In other words, estimates of drive lifespan are pretty vague right now. That said, generally and overall, consumer-level SSDs are expected to last at least five years, but again machines currently using them haven't been on the market long enough for anyone to find out.

What remains true, however, is that the biggest factor in the lifespan of an SSD is, of course, its usage. And here, as it stands currently, our operating systems aren't working in their favour.

Dealing with limitations

To help mitigate the effects of limited erase-write cycles there are a number of storage paradigms – long borne by the history of mechanical spinning-platter hard drives – that will need to change. They occur on a variety of levels.

First and foremost, operating systems like Windows and Linux treat storage like read-many, write-many devices. Both OSes are fond of swapping out to disk for virtual memory, using temporary files, writing log files, storing application caches, and updating metadata (most of which you rarely ever use) with files and folders on your system – all of which adds up to frequent, consistent, writes to disk. Something that you don't need to blink an eye at with hard drives, but suddenly comes into focus with SSDs. And that says nothing for activities like defragmentation – given the large erase block of SSDs, defragmenting would whack a nice chunk of your write-cycles every time.

But this also highlights some of the beauty of SSDs – for the first time, this is a storage medium that doesn't write to concentric tracks on a platter, the effect of which impacts both seek times as heads move to read and write data, and transfer speed as outer tracks rotate faster than inner

Intel's X25-M is the current speed king – but for how long?

tracks. In the past this has necessitated functions like defragmenting to ensure files are contiguous and reduce head movements, let alone specially designed I/O queues and scheduling in drive firmware and operating systems to take head and rotational latency into account.

With SSDs, this is all moot – the entire volume is a consistent transfer rate, and at incredibly fast seek times: Intel's new X25-M, the current king of the hill, has a seek time of 0.085 milliseconds. That beefy Seagate 7200.11 you've got spinning in your system has a seek time of 12.8 – the SSD could complete 150 seeks in the time it takes the Seagate to do one!

For SSDs, file fragmentation doesn't actually matter, which is a first for our beloved PCs. And just as well, given defragmenters will only wear them out faster.

Which leads us to the topic of wear levelling.

Wear levelling

Some flash devices, including USB keys and SSDs, use a technique known as *wear-levelling* to help prolong the life of the media.

Wear-levelling attempts to work around the limited write-cycle lifespan of blocks by arranging data so that writes are distributed evenly across a medium, rather than re-writing files in place. This way no single block prematurely fails due to a high concentration of erase-write cycles. However the efficiency and implementation of these algorithms is important – given the minimum erase block size, you don't want wear-levelling working against itself as it distributes data across a disk, erasing large blocks only to write small segments in the process.

... you don't want wear-leveling working against itself as it distributes data across a disk, erasing large blocks only to write small segments...

Wear levelling is currently implemented in many devices by the onboard controller at a basic level, but more advanced methods can be implemented by filesystems specifically designed for SSDs, as well (see Linux and SSDs below).

Overall, however, the biggest single contributor to SSD lifespan is how frequently writes occur. And this, as well as the actual performance of an SSD, is all down to the operating system.

Optimising for SSDs

Make the most of an SSD with the following tips for Windows and Linux.

Windows

- Move the page file to a hard drive (disabling not advised with Windows).
- Redirect Windows temp directory to a hard drive.
- Redirect browser cache to a hard drive, or disable it.
- Disable SuperFetch (Vista), Prefetch (XP).
- Disable Indexing service.
- Disable System Restore.
- Disable NTFS last access timestamp.
- Disable background defragmentation.
- Disable unnecessary services.

Linux

- Use Noop scheduler (add elevator=noop to kernel in Grub).
- Add 'noatime' option to drive mounts in /etc/ftsab
- Move '/tmp' to a hard drive or ramdisk.
- Move '/var' and even '/home' to a hard drive.
- Move swap partition to a hard drive, or disable it.
- Redirect browser cache to a hard drive, or disable it.
- Disable unnecessary services.
- Use LogFS or UBIFS, if you're feeling brave

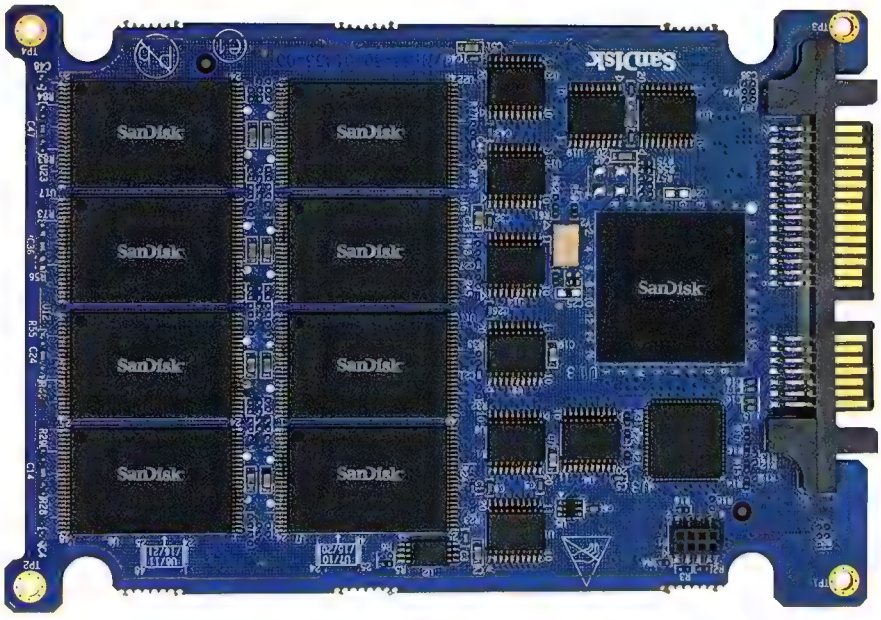
Windows and SSDs

Both Windows and Linux are tuned for spinning platter disks and use queuing alogrithms and I/O schedulers to optimise performance specifically for them. Great for hard drives, not so great for SSDs.

One problem is the I/O scheduler, which usually has two core tasks: keeping multiple disk intensive processes happy, and optimising throughput for a given medium.

Windows has just one scheduler, which in Vista is designed to provide prioritised I/O requests and bandwidth reservation as needed. It's also designed to use small 512-byte sector transfers, which works well with disk drives but gets in the way with SSDs – they fare better when the sector size matches the default 4k page size of the memory. Unfortunately, the 512-byte transfers are hard-coded into Windows.

All this leads to less than stellar performance (yes the benchmarks you've seen so far should be even *higher*), and when you add this to Windows' habit of constant drive accesses with its myriad of background processess (everything from SuperFetch to defragmenting), it's not doing any favours for SSD lifespan either. So it's no surprise that SSD maker Samsung recently announced it would work with Microsoft to help improve the situation. Another SSD manufacturer, SanDisk, also recently publicly raised the issue, but went as far as to say that what's needed are new SSD optimised controllers to "make up for the shortfalls in Windows". Ouch.



No moving parts, no noise, low power, high speed – what's not to like? Oh right, the price...

And all this says nothing of how NTFS affects the situation – a filesystem designed from the ground up for hard drives – not optimised for dealing with how SSDs fetch and cache data, or for maximising the longevity of the medium.

Linux and SSDs

Linux is in a little better position. While it, too, has been tuned over the years for spinning platter drives it has by default four different I/O schedulers selectable at boot time: Anticipatory, CFQ (Completely Fair Queuing), Deadline and Noop.

Anticipatory and CFQ (the default scheduler) are designed to optimise throughput for desktop and small server systems, while Deadline is designed for intensive server and database workloads. Just like with Windows' single scheduler, none of these were ever designed with SSDs in mind.

But the Noop scheduler, by its very nature, isn't too far off. The Noop scheduler is basically little more than a simple FIFO queue and is designed to be used with high-performance disks and external controllers that handle scheduling outside the OS – and so essentially passes requests straight through with no interference. Which just happens to make it ideal for SSDs.

As schedulers can be assigned on a per-disk basis in Linux, it's possible to use CFQ on hard drives and Noop on SSDs in the same system.

Then there's the filesystem. As with NTFS, filesystems like Ext3 are designed with hard disks in mind – however Linux has two filesystems in development designed specifically for SSDs: LogFS and UBIFS, both under consideration for use with the OLPC (One Laptop Per Child) project.

LogFS differs from traditional filesystems in that it works with the page size, large erase-write block, and fast seeks to optimise performance as well as extend lifespan by not re-writing blocks in place (overwriting a file moves it to a new block). Developed by some boffins at Nokia, UBIFS is similar and works on top of the UBI (Unsorted Block Image) layer in Linux's MTD (Memory Technology Device) layer.

Both are nearing maturity for entry in the mainline kernel, but can be used in the meantime by patching the kernel.

Still, like Windows, Linux runs a variety of background tasks and while it generally isn't as intensive as Windows it still has a habit of writing log files and so here, too, the default setup of most Linux distributions isn't with SSDs in mind. A bit of tweaking and using the Noop scheduler will go a long way to ensuring better performance.

See the 'Optimising for SSDs' sidebox for hints and tips for doing this for both Windows and Linux.

All this leads to less thans stellar performance (yes, the benchmarks you've seen should be *higher*)...

SSDs come in sizes from 16GB to 256GB at the moment, and sizes will continue to grow.

What about NCQ?

With the very nature of SSDs you would think queuing techniques like NCQ (Native Command Queueing) – designed to optimise read and write operations by re-ordering requests to align with drive head trajectory – wouldn't be necessary anymore.

Indeed, early SSDs don't use any NCQ or similar queuing disciplines, but curiously Intel's X25-M *does* support NCQ. The reasoning? Straight from the horse's silicon mouth: NCQ helps to compensate for latencies in the host PC. Yep, since the SSD is now fast enough to wait on the PC for more instructions (rather than the other way around), the queue – which can store up to 32 instructions – helps keep the drive busy while it's waiting for more.

This may not be as crazy as it sounds: rather than being used to optimise head movements, as a queue it likely acts as another form of buffer, reducing bottlenecks in a subsystem (see Atomic 90, X-Ray, *The cache* to learn more about buffers).

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I/O OF THE MONTH

The electrons get lost

I came upon this article while wandering on the net:
tinyurl.com/4ayqzm
(It's the last entry I'm referring to.)
Is it really possible to protect gear against a lightning strike by tying knots in power cords?

Bob Davis

No, not really.

Apparently, a knotted cable subjected to a lightning-right-outside surge will blow apart and pass very little current, proportionally speaking, to whatever it's plugged into. If you seriously believe, however, that enough power to actually *explode* the power cable will not have any deleterious effect on the hardware which until recently was plugged into what is now a cloud of PVC and copper vapour, then I've got a lovely bridge to sell you.

Lightning definitely does do some very peculiar things, and I can certainly believe that a monster discharge *could* miss, or hit, valuable hardware depending on the physical configuration of the supply cable. If, for instance, you wind a power lead around a metal sink drainpipe a couple of times, a lightning discharge into that cable will probably punch through the insulation and go to ground that way, rather than take the longer and narrower path through the thing the cable's powering. There are many anecdotal accounts of things like this happening.

But just because the bulk of the energy shoots to ground some other way does not mean that there won't still be a very large – by domestic standards – spike in the voltage the equipment sees. Knots or other humungous-zap-catchers will probably only stop energy above threshold X from being seen by the powered device. Threshold X is likely to be more than enough to destroy the device.

So using knots as your *only* protection against lightning strikes is unlikely to do any good. It may give you a 'lightly scorched' dead computer instead of a 'blown apart' one, but this is not a big advantage. I suppose it might be worth doing as a first line of defence, though – for the power cable that goes to your power conditioner, say.

Note that the energy levels we're talking about here mean you're probably going to have to have the building rewired afterwards. If lightning strikes anything connected to your house's electrical wiring, it's probably going to be expensive.

Tying knots doesn't do any *harm*, though. So by all means give it a go if you like.

I mentioned this in passing in my old piece here:
www.dansdata.com/sbs9.htm

I/O OTM WINS A LOGITECH G5!

There's a mouse in the house. Okay, it's not in the house, it's in I/O. And it looks damn good.

Religious differences

Why is it that Linux still has only very dodgy NTFS support out of the box? You don't get write support unless you download the 3G driver, and you don't get ACL support at all (or if you do, then I haven't experienced it).

Is it just that nobody cares enough to spend the effort, or is Microsoft actively trying to prevent NTFS support on Linux?

Nathan Baker

The NTFS filesystem is not an open format. As with various other Microsoft-developed formats (Rich Text Format, for instance, is best defined as "what Word saves when you tell it to save as RTF"...), the only way to get other systems to deal with it is to reverse-engineer it. And yes, Microsoft might well get in the way of this process, if they think your reverse-engineering looks suspiciously like just decompiling bits of the Windows kernel and saying it's yours.

Since NTFS has a lot of features, and hasn't even been the standard Windows filesystem until the Win95 line died out, relatively little progress has been made. People with the chops to reverse-engineer filesystems are likely to be more interested in writing their own.

Sword-fighting is nothing without insults

I recently went forth and bought a new computer (quad-core, ATI video card). I'm currently running 64-bit Vista to take advantage of extra RAM, as my work revolves around 3ds Max, Photoshop, Illustrator and Revit.

But sometimes I like to take time off from work and play. But running 64-bit Vista causes issues: Monkey Island 3 won't work!

Is there a workaround you're aware of? Or will I need to bite the bullet and go down

the dual-boot path just to play one game? I did a little rummaging on Google and found a patch for Monkey Island, but is there a workaround so I don't need to constantly do this?

Tristram Taylor

O If turning on all of the compatibility options in the Properties for a DOS-era game don't get it working in Vista (or in XP, for that matter), your next stop should be DOSBox:

http://www.dosbox.com/

DOSBox is a free emulator which looks, to software running in it, like an MS-DOS PC with all of the add-ons that people had to spend forever setting up in the DOS days. It was specifically created to run old games on new PCs, and yes, it even works on 64-bit Vista.

Resolution wrangling

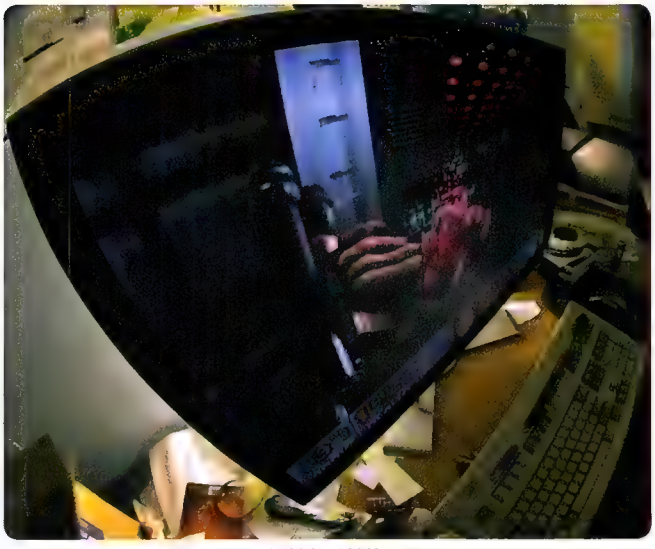
I I recently bought myself an Acer X173w monitor, with a native resolution of 1440 x 900. I like this monitor, but the big resolution compared to my old CRT's 1024 x 768 makes gaming less fun. Better image quality, yes, but less frames per second.

I tried lowering the resolution to 1280 x 800 and 960 x 600, but the image displayed is ugly.

As far as I know, the only other resolution that can be clearly displayed with this monitor is 720 x 450, not counting the lower ones. That should be smooth enough for me, as it is very close to NTSC DVD resolution. The problem is, I can't seem to find any way to run any game in that resolution, and it will be quite a while before I can afford a new graphics card.

I have to admit that this is not a serious problem. Turning off some pretty settings helps nicely. But I just keep wondering about this. Can you help me here?

Andhika Nugrahatama



320 by 200 maps perfectly onto 2560 by 1600!

O Yeah, 1440 by 900 is indeed a tough resolution to halve (or quarter, depending on whether you look at it linearly or by area).

The solution is as obvious as it is simple: Merely purchase a 30-inch 2560 x 1600 screen, and you'll now be able to run games at decent speed in the standard 1280 x 800 resolution!

If for some reason this solution doesn't appeal to you, all I can suggest is that you try fiddling around with a video-card-tweaking program like EnTech's famous PowerStrip. That ought to let you set your monitor to any resolution that your video subsystem can actually generate. But it probably won't, in this case, work.

720 x 450 is, I think, pretty much never seen as a standard PC resolution. It's below the 800 x 600 minimum for Windows XP, for a start. But it's not that outlandish. It appears as a standard resolution in various Linuxes and also Mac OS, I think.

Note that running an LCD monitor at half of its native resolution each way won't really give a 'smooth' result; instead, it'll just lay one image pixel over each four monitor pixels, making jaggy lines considerably coarser. To smooth them out, you'd have to use Full Scene Anti-Aliasing, which would increase the load on the video card and somewhat defeat the purpose.

I don't mind the look of LCD half-res, myself; it's only really a problem if you're playing a sniper or something and so need a ton of resolution. But you may find that the fuzzy-scaled look of intermediate resolutions isn't really that bad in comparison.

In the olden days, LCD monitors either used hideous blocky nearest-neighbour interpolation to scale lower resolutions up to cover the full screen, or they just left a black border around the edge. I don't think it's possible to buy a monitor that doesn't do some smoother kind of interpolation any more, though. Many monitors these days are 'dumb', however; they actually make the video hardware do the scaling so the graphics card actually sends them a full-resolution image all the time. If that's the case, you may once again find that dropping the resolution doesn't give you as much of a speed boost as you'd hoped.

Pins 1 through 47: +5V

I PATA (ultra ATA etc) cables have 40 pins, and the plug and cable are 60mm or so wide. Big wide fat cable & plug.

SATA cables have seven pins, the plug is about 13mm wide, the cable about 8mm. Big improvement.

However, PATA power cables (aka Molex connectors, although that's a bit of a misnomer) have four pins, 23mm or so wide. While SATA power cables have... 15 pins, 23mm wide. Hmmm.

Why no decrease in connector size, and why the increase in pin count?

The 15 pins are fed by the same four wires that feed the four pin PATA cable (which strictly speaking could be three wires, since two of them are ground).

Checking the spec, each SATA-power voltage has like three pins, all of which are coming from the same cable anyway. (OK, they added optional pins for 3.3V which isn't in the PATA cable, but they gave that three pins too, not to mention six pins for ground!)

What gives?

Is it simply to make the power plug "different from the data cable" so that idiots can't plug them in the wrong socket?

Tim Cox

O I think the multiplicity of pins is just to get lower losses from resistance. The wires in SATA power leads are pretty small-gauge, and the terminal connectors are very small too. So they just connect the same rail of the PSU to multiple wires that run in parallel, which means each individual wire has to carry less current.

Many other computer power leads do the same sort of thing. A standard old-style 20-pin ATX connector, for instance, has three +3.3V wires, four +5Vs (not counting the single 5V standby wire), and seven earths. The dual earths in 'Molex' power leads are there for the same reason.

The economics of free

We're getting the feeling that Ashton Mills may like open source a little...

Recently, and with news of the upcoming economic downturn, Red Hat CEO Jim Whitehurst was quoted as saying that the it would lead to a boon for open source – reasoning that as companies felt the pinch, more and more would turn to cheaper, alternative, open source solutions.

About the same time a commentator called Andrew Keen wrote a piece stating that the coming economic downturn would "give open source a good thumping" and that projects would die in droves as programmers focused on making money to afford the basic essentials of living, instead of spending time writing code for free.

Two opposite perspectives and I can't help but think that both of them, though to a lesser degree Whitehurst, are missing the point. Granted Whitehurst is speaking to the enterprise – and I think he's probably right here, businesses will start counting the cost of all those licenses and exorbitant software costs and just wonder if there isn't a cheaper way (there is).

And Keen's less than, well, keen view on the world assumes that most people contributing to open source projects do so only because they have the monetary base to support themselves to do it. He seems to forget many programmers working on open source projects are paid to do so.

And for those that aren't, for whom it is a contribution, whether they work or not isn't part of the equation, because their motivation doesn't come from money. Many work for themselves or their peers, motivated by their ability and passion.

Either way working on open source projects is *highly* conducive to employment – having work active, highly visible, and actually being used is a far greater resume than a degree on a piece of paper. Despite Keen's world view, not all contributions can be seen through greenback glasses, and it's shortsighted to narrow one's perspective, like he does, of a multi-faceted development model and industry that is open source.

If some programmers are going to find themselves unemployed in a coming recession, being involved in a project is their best bet to getting another job.

So on that front, no, the economic downturn won't slow the growth of open source projects and, as Whitehurst suggests, is more than likely to see them grow, but for more than just the enterprise. It's not rocket science: why pay for what you get for free? Who in their right mind would pay for Microsoft Office when you can get Open Office? Or, for that matter, Windows itself? Certainly for the SOHO arena, saving a few hundred dollars by dropping the Windows tax is an obvious move.

And as the corporate playground turns to alternative, cheaper, solutions IT admins with *nix experience are going to see *more* opportunities, as their skills come into higher demand.

Ultimately, no one knows what's going to happen until it's here, but as the adage goes 'necessity is the mother of invention'. If anything, tougher times will drive innovation and it's the affordable and free open-source solutions that will be at the heart of it. It's easy to forget that we have Linux now – something that changed the world – because at the time Linus couldn't afford a version of Unix for his spanky new 33Mhz 386. So he wrote his own. Not for money, not for fame, just a volunteer contribution.

So while an economic downturn will likely hurt a lot of people in a lot of ways, and some may come and go from open source projects as a result, on the whole both their use and uptake is likely to increase. For better or worse, it's a thriving opportunity.

And not the least bit ironic that in a time where items of value will lose it, items with no value at all will gain it.

Certainly for the SOHO arena, saving a few hundred dollars by dropping the Windows tax is an obvious move.

Ashton Mills is without doubt an item of value.
So we are told...
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Tweaked perfection or a bunch of cosmetic tomfoolery? **James Matson** gets friendly with the world of modded GPU drivers.

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It's a thing of beauty encased in sleek black plastic that reflects the hunger in your eyes as you lovingly caress the cooling fan mounted to one side. To compliment this masterful sliver of silicon, you've picked up the latest 'games never looked this good' FPS, complete with engine promises of real-time global illumination and gorgeously rendered environments spanning eleventy billion kilometres of game area. Good thing you bought that new video card, eh?

So you're set; except for the little matter of drivers. Those sneaky little liaisons between hardware and the operating system often get less attention than they perhaps deserve. If you're like most people, you'll head straight for the NVIDIA or ATI website and grab the latest reference drivers for your card, and there's nothing wrong with that approach. The drivers function, they get your GPU recognised, and gaming can commence unhindered.

But Atomican's aren't most people. We like our hardware to perform outside the boundaries of mere reference drivers and stock settings. We want to experiment, try the alternate – and sometimes shady – world of the non-standard. So there's another place for people like us: the world of modded drivers. Atomic divided some time between benchmarking and chewing the ears off modding teams to discover exactly what these modded drivers are, how they get made, and whether they really are worth your precious download time.

Read on and be filled with geek knowledge!

Better the driver you know

To understand and appreciate what goes into a modded GPU driver the best starting point is to have a grasp of what makes up a driver in general. In simplest terms, a driver is a chunk of software – often written in C – that gets hardware and the OS talking happily, so that requests can be made from (for example) a game that sits on top of the OS through to the device in question to cause the sweet action that happens on-screen. Device drivers are powerful little critters which operate in kernel mode rather than the more standard 'user' mode of an application. This means drivers get to access to all kinds of low-level functions within Windows not normally available (but obviously required for a device driver to work) and there are no restrictions to the driver being able to write and read protected areas of memory or be in direct I/O access with physical devices.

It's this ability for drivers to cut through the higher level guff that most ordinary applications must wade through to execute code on a PC that makes them both tricky to successfully write, and potentially catastrophic when they go wrong. Ever wondered why so many BSoDs or fatal exceptions are caused by driver mismatches or incompatibility? The unrelenting low-level access to the architecture that is the nature of a software driver – GPU drivers included – is largely to blame.

Keeping things basic, two important bits of code allow a driver to function; a DRIVER_OBJECT data structure created by Windows and a DEVICE_OBJECT data structure created by the driver itself. The DRIVER_OBJECT is a block of memory allocated by Windows that describes where the driver code is loaded into memory, the name of the driver itself and the functions supported by it. The DEVICE_OBJECT structure is created by the driver itself and is used to reference a physical device like your video card, describing different characteristics of the device. The DEVICE_OBJECT becomes the target of I/O (Input / Output) requests from applications like your favourite blood-bath FPS, acting as the go-between for user-mode programs to get functionality out of actual hardware. In amongst this are functions stored in the driver's DLL (Dynamic Link Library) files that can be exposed and used to get the magic happening on the physical device in conjunction with Microsoft's unifying DirectX APIs.

The crux of it is that drivers are complex, clever and absolutely required to get any useful functionality out of your GPU.

There's a hell of a lot more going on, but we don't have the room to get too deeply involved there. The crux of it is that drivers are complex, clever and absolutely required to get any useful functionality out of your GPU. So, where do modded drivers come in? Surely they are super enhanced software where the guts of reference drivers from NVIDIA or ATI have been completely revamped to allow your video card to wear its underpants on the outside and be super fast? Unfortunately, the truth is a little less glamorous.

Where to get them

Here's a list to get you started on where to find modded drivers out there on the internets. Just a word of warning though – not all these places are timely in getting drivers out in sync with the official releases, so bookmark like crazy and keep coming back.

NGO: www.ngohq.com
DNA: www.donotargue.com
Omega: www.omegadrivers.net
TweakForce: www.tweakforce.com
Zer0point: www.driverheaven.com

Hacking towards a better product

To discover exactly what goes into a modded driver, we approached several of the well known groups on the Internet that tirelessly work on making stock standard GPU drivers better for the community. Among them Eran Badit, editor in chief and software manager of NGOHQ.com, who looks after the team responsible for NGO modded drivers for ATI and NVIDIA products,

"We're unable to make deep driver-level modifications (aka, cracking). We thought about it in the past and even tried, but it generated more problems than it's worth. First of all, our target audience is gamers and we don't want to get them banned, since many anti-cheat

The ten steps of the modding pipeline

1. When a new official driver is released, modders spend some time monitoring it.
2. Check on the feedback at 'official' channels like the NVIDIA, ATI forums or Guru3D.com.
3. Gather together a list of intended tweaks or improvements and perform the mods.
4. Launch an internal beta test.
5. Fix issues from the internal beta test and release to the external beta testers.
6. More than likely alter the build and re-release to the external beta testers.
7. Once you're happy with the results, launch a wide external beta test.
8. Launch to the public with a press release.
9. Watch as the feedback and bug reports start piling in.
10. Rinse and repeat!

mechanisms like PunkBuster have major issues with deep driver modifications. At this stage we use more basic methods to modify the drivers, like installation scripts, registry entries and playing with the in-built features."

The motivation for creating the drivers seems to be uniform regardless of who you speak to; it all comes down to squeezing better performance or image quality out of hardware, or according to Eran, creating a more user friendly product. "The original driver developers (in this case ATI and NVIDIA) have their own policies, bureaucracy and marketing plans" he says. "They're unfortunately more likely to act with the best interests of the company – rather than the consumer – at heart. There's nothing wrong with that, but we're coming at the driver purely from the customer angle, and spend our time making the driver more consumer-friendly, producing better image quality/performance or retrieving crippled features to offer maximum compatibility with older hardware."

Eran cited mobile GPUs as a perfect example. "Due to agreements and licences with OEM producers like Dell, Acer and Toshiba, there is no 'official' support from NVIDIA or ATI for mobile GPUs." The driver modders get around this by adding DeviceIDs to the driver for any number of mobile or aged GPU devices, like the Mobility Radeon 9500 et al, allowing them to offer the full gamut of support for just about any card you can think of. Doesn't that just give you that warm and fuzzy feeling?

Wandert 'KillerSneak' Van Bruggen, who looks after the DNA driver modding team at **www.donotargue.com** pulls the official drivers apart in much the same way,

"A lot of the tweaks we do are the result of picking through the ATI or NVIDIA source code (not the actual source that the drivers are built from, but the resulting .sys and .dll files produced). We use tools to get inside those files and muck around with settings to see what we can come up with. The .ini and .inf files that look after the driver install itself are also a pretty good starting point to alter features or settings, as it allows us to make changes within a certain range of values (quality settings for example) without having to touch the source code."

Image quality

We could have just stamped this screenshot six times on the page to demonstrate the lack of quality change between drivers, but we like to save ink.

DRIVERS IN USE FOR TESTING

NVIDIA Drivers	ATI Drivers
Reference Forceware (169.25)	Reference Catalyst (8.7)
NGO 1.169.25 (Based on Forceware 169.25)	DNA ATI 8.7 (Based on Catalyst 8.7)
NVIDIA Omega 1.169.25 (Based on Forceware 169.25	Xtreme-G Catalyst 8.7 Vista (Based on Catalyst 8.7)

The benchmarks

SYSTEM SPECS:

CPU: Intel Quad Core Q6600 @ 2.40GHz

Motherboard: Gigabyte P35-DS3P

Memory: OCZ PC2 6400 Dual Channel 2 x 2GB

GPU: XFX NVIDIA GeForce 8800GT/ Gigabyte ATI HD4850

Storage: 3x WDC WD5000AAKS-00YGA0 ATA 500GB

O/S: Windows Vista Home Premium 64-bit

BENCHMARK SOFTWARE:

3dMark06 Professional Edition

HardwareOC Unreal Tournament 3 Benchmark tool

Crysis Benchmarking tool

The letters of the law

So you're reading through all this talk of altering this file or exposing that file and we're betting the question of official support or legality has crossed your mind – because let's face it, once you start mucking around with the proprietary software of another company you're basically throwing yourself – naked and crazed – onto spongy earth littered with landmines and lawyers right? Eran explains,

"Before the ATI-AMD merger for example, we received a lot of cooperation from ATI's PR department in the way of information, samples or support. After the merger, unfortunately, the cooperation dried up and we're no longer receiving anything on the press or developer level. NVIDIA, on the other hand, never really had much to do with us."

Eran is being modest however; despite not having a lot to do with NVIDIA now, the past has been littered with colourful run-ins.

In 2006 NVIDIA sent a cease and desist letter to NGOHQ.com in relation to NGO's offered SLI patch, which would apparently enable SLI on boards with a non NVIDIA chipset. The word on the street was that the patch came supplied by motherboard manufacturer ASRock, designed to enable SLI on ASRock boards. Again in 2007 the tension between NVIDIA and NGOHQ.com reached critical when the GPU giant wrote to the NGO team reminding them politely that as the exclusive owners of the driver IP (Intellectual Property) it held the only right to authorise distribution of its software.

NVIDIA PR manager Bryan Del Rizzo laid down a simple ultimatum; cease distribution within two weeks of the letter or the matter may be taken further. NGOHQ hit back, claiming that as its servers were hosted in Israel and not the United States, copyright law under US section 106 did not apply. They also added that local law permitted it to distribute copyrighted software as long as its intended use is private/ educational rather than commercial. NGOHQ also cited the fact that the drivers it offered didn't include any code-level modifications, only Windows script files to change default settings that accompany the driver installation. The end result – over a year later – is that NGOHQ still offer the modified drivers; whether that's a result of legal grey areas or simply that NVIDIA stopped caring is anyone's guess.

The owner of the Omega driver mod website got some legal loving from NVIDIA as well

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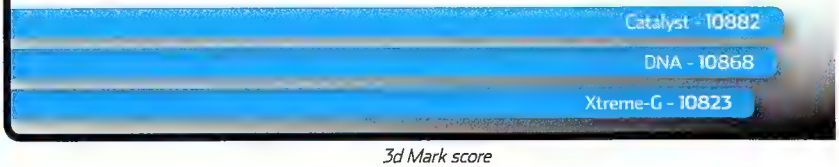
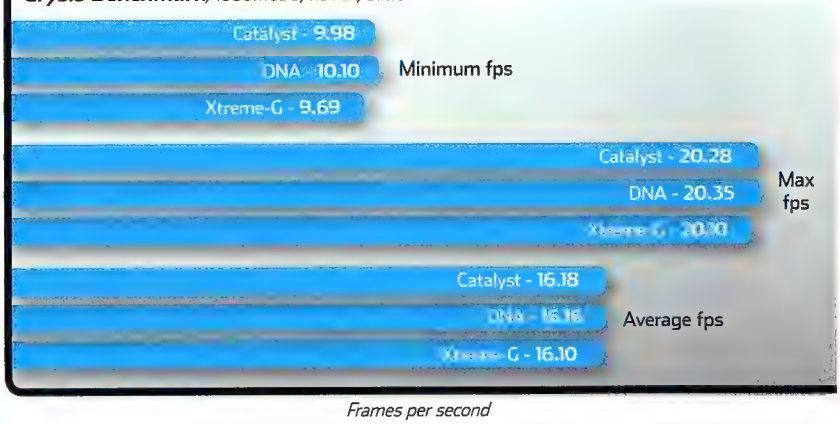
ATI driver set

***3d Mark 06**; 1680x1050, Optimal texture filtering*



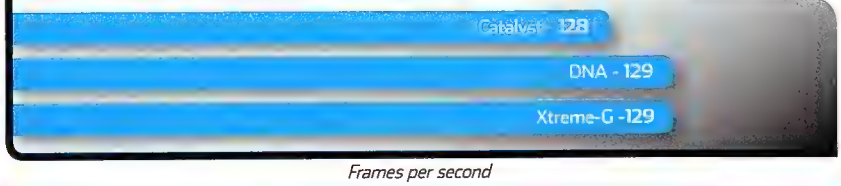
3d Mark score

***Crysis Benchmark**, 1680x1050, no AA, DX10*



Frames per second

***Unreal Tournament III**, vCTF-Corruption, no AF 16x*



Frames per second

over his distribution of modified software. The developer was told to remove certain drivers (and the NVIDIA logo) from his site after NVIDIA received customer complaints of GPU instability after installing a set of Omega-modified drivers. The Omega drivers were at the time the largest and most well known after-market drivers available, so an immediate internet backlash against NVIDIA ensued on forums and tweaking sites until NVIDIA clarified its position in an official statement,

"After reports of instability stemming from the third party drivers we requested they be removed from the web site distributing them as they were not clearly marked as non-NVIDIA."

The statement went on to placate seething geek hordes regarding NVIDIAs stance on modded drivers, "NVIDIA does not – in any way – condemn the development of third party drivers; quite the opposite. We recognise the importance of third party drivers and for this reason we have not asked for work on future drivers to cease."

So in essence, one bad egg in the basket of Omega drivers caused quite a stir among the modding community, but in the end Omega drivers kept on trucking and is – at the time of writing – still modding NVIDIA and ATI drivers.

The truth frame by frame

Now that we're familiar with the ins and outs of modded drivers, the scene is set for the real question, the one that seems begging to be asked from the outset. Are modded drivers any good? We know that's the ultimate query and the only real one that matters. To that end, we've put several driver sets from different modding teams through their paces and have the results to show for it in terms of performance and image quality; with a few caveats, however. Although ATI and NVIDIA are reasonably precise about the continued release of new driver sets, modding teams are not. Due to this, we had to balance the desire to have the most recent drivers available against getting third party driver sets to align in version against the reference ones. Check out the table lumped in with our benchmark results to see exactly what versions we ended up using, but in short we ran the ATI Catalyst 8.7s against as many modded 8.7 sets as we could and the NVIDIA Forceware 169.25s matched with as many sets based on the 169.25s as possible.

Obviously there were newer reference drivers (and in some cases modded drivers) available, but this gave us the most even spread possible. The downside of all this numeric nonsense is we couldn't run the XFX GTX260 through its paces, because it wasn't supported in the Forceware 169.25 drivers, opting for the XFX 8800GT instead. We did try our best to persuade the various modding teams to release completely up-to-date drivers in time for this piece, but they kindly informed us that if we continued to sit outside their respective bedroom windows naked and covered in baby oil, they'd call the cops. Cest la vi

The awful truth

So we benched like crazy, ripping out cards, sticking in cards, setting up flybys and tearing our hair out at the seemingly robotic consistency of the Unreal Tournament III framerate until we discovered the FPS cap hidden away in the Base Engine.ini of the game. What did we learn? Well, insofar as performance and image quality are concerned, there's not a lot to write home about in the world of modded drivers. Both the official ATI and NVIDIA drivers did produce a slightly higher 3dMark06 score, but as the modding teams are fond of saying, the drivers may be engineered towards higher synthetic benchmark scores rather than real-world performance.

As far as Crysis and Unreal Tournament III go, the modded drivers for the 8800GT and HD4580 gave a better framerate in each of the tests we ran, but by such a marginal amount as to require some kind of Star Trek quantum phase-variance device to pick it out when you're busy fragging.

We ran image quality tests by capturing and comparing the same frame during the UT3 benchmark for each of the drivers tested, but could find no discernable increase or decrease in texture quality to need to show the results here. We were expecting something akin to the XGI mischief when everyone realised the only way its ill-fated Volari range of video cards were competing in benchmarks was to reduce the texture quality to 'pea soup' level.

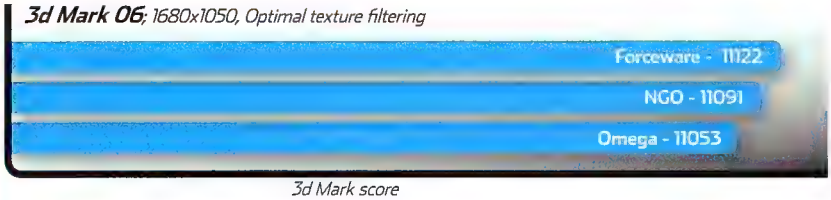
Somewhere in the deepest chambers of our cutting-edge hearts, we'd hoped to see bigger, bolder numbers produced.

It all seems a bit disheartening really, doesn't it? Somewhere in the deepest chambers of our cutting-edge hearts we'd hoped to see bigger, bolder numbers produced, wider gaps and the like – but were sadly disappointed.

What this doesn't mean is that after market drivers have no place in the world – quite the opposite in fact. While performance and image quality are the obvious measurements and the easiest to place into bar charts and graphs, the aim of these drivers goes behind benchmarking.

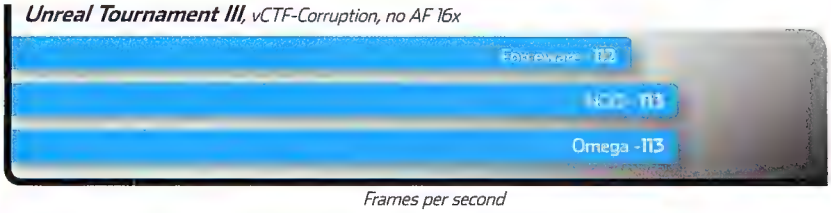
The dedication by teams like NGO, DNA and Omega to ensure they support legacy hardware, or notebook GPUs, as well as providing various options within the installer not commonly seen in official drivers is something worth noting, if not for its tangible effect on the frames-per-second of your favourite grunty GPU.

NVIDIA driver set



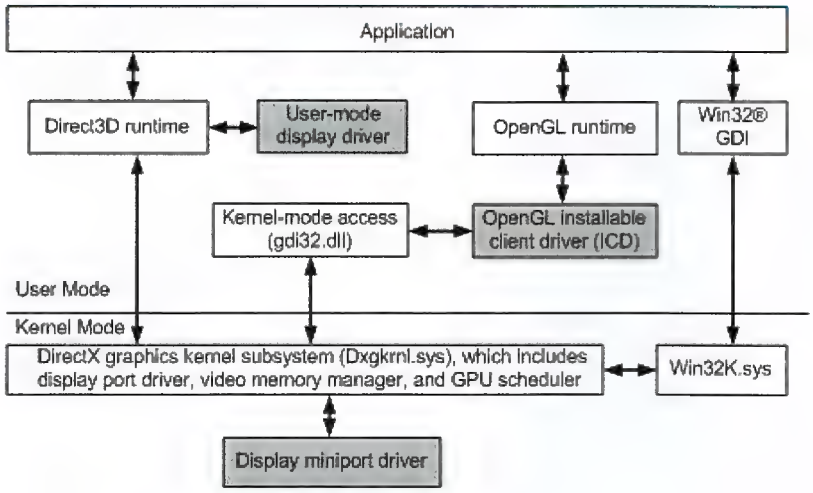
3d Mark score

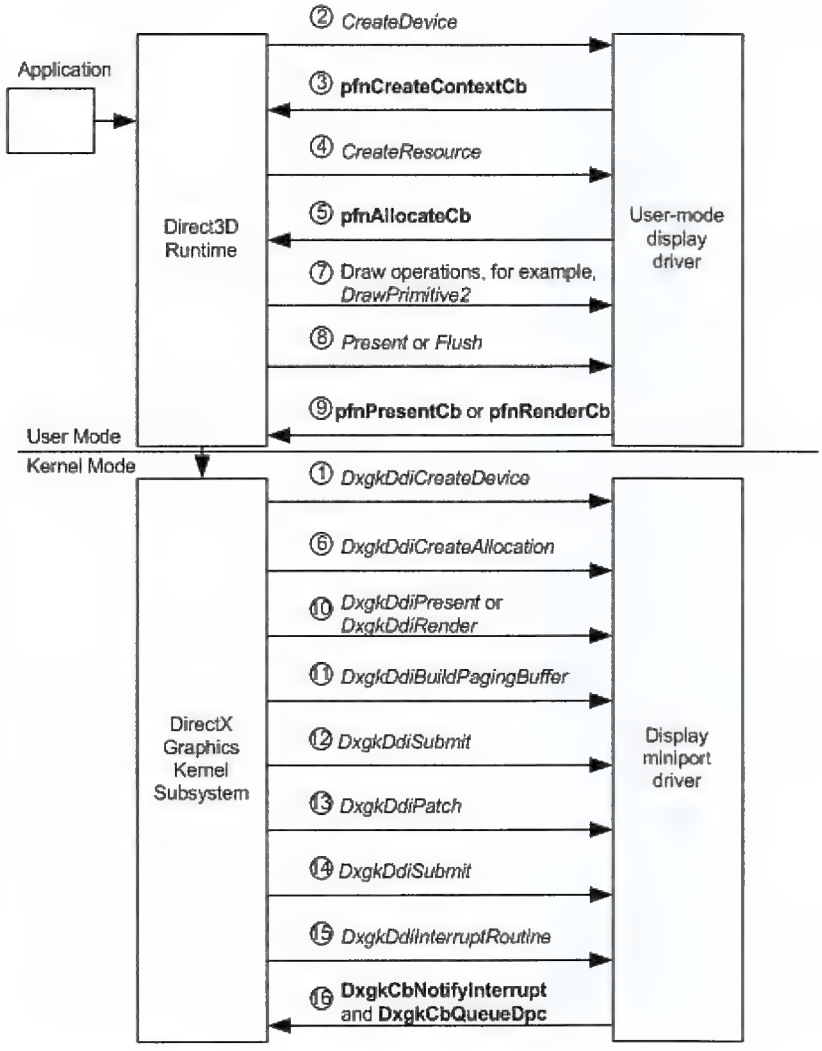
Frames per second



Frames per second

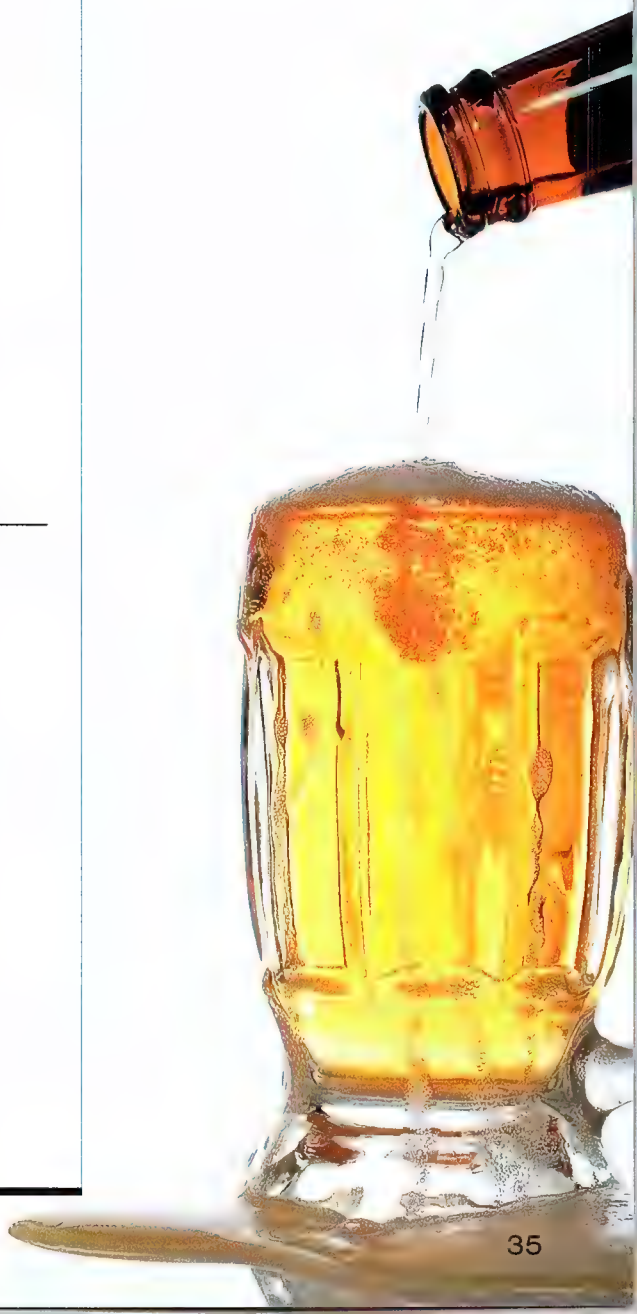
How Vista Display drivers work





If you're a performance nut who could seriously do with that extra one or two frames per second in games or in benchmarks, then by all means go forth – wild eyed – and begin experimenting with the world of modded drivers. If you're having difficulty finding support for a certain GPU, be it outdated or of unique design, again don't dismiss the work done by these talented modding teams.

However, if you're just after a driver that gets your card working in normal conditions to produce gaming goodness, you're probably going to be far better off keeping up-to-date with the reference drivers as they roll off the NVIDIA or ATI assembly line for the moment than dealing with the often laggy after-market scene, or alternatively – like a truly hardcore mix of Atomican and Macgyver – you could go out there and mod your own using a rubber band and a tin of molasses.



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HARDWARE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

Everything changes this month, with the introduction of the long awaited, much anticipated Nehalem CPU; or as it's officially known – Core i7.

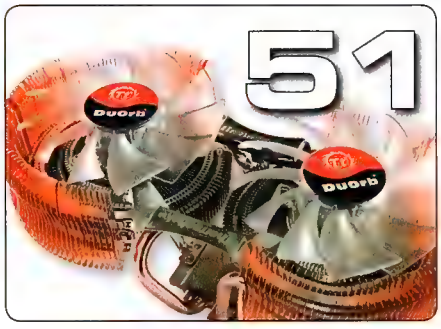
We have the first review in the country for you to feast your eyes on, and we're pretty damn excited about it. Not only is this the cutting edge kind of stuff we live for, but this new chip and chipset is fast. Damn fast. How fast? Well, that would be giving it away, now, wouldn't it? We've got a full review of the high end Core i7, a reference X58 board, and a board from the mobo master, ASUS.

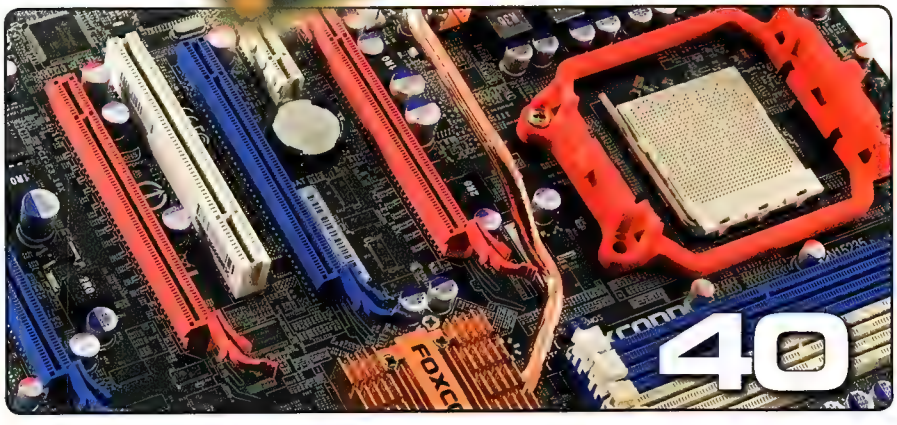
We have a swathe of other stuff to throw at you too, from overclocked graphics cards from Gigabyte, ASUS, Sapphire, Foxconn and XFX, to CPU coolers with a difference. All very juicy stuff.

Plus, our Head2Head this month is all about power. Power supplies, to be exact, and we've got over 15 of the best (and, honestly, not so best) on test to find out the best way for you to power up and protect your system.

Mighty Atomic Power Rangers... Activate!

HARDCORE CONTENTS





Nehalem is here

The ultimate performance processor is come.

Intel has been dominating the processor industry for the past few years, spurred on by its amazing 65nm Core 2 Duo and Quad releases. This was only furthered when it shrank down these processors, squeezing the same cores into the same space using a 45nm process, bumping up both the cache and performance significantly. Two years later, we enter a new phase, complete with a new core, and a whole new Intel.

Architectural Advances

Nehalem is built around the tried-and-true 45nm process, but is set into a completely new foundation – the LGA1366 socket. This socket (funnily enough) has 1366 pins inside it, and is physically larger than the current LGA775. It uses a similar lever securing method as 775, but also includes a metal bracket over the back of the motherboard – physical stability and strength is much improved. But the socket wasn't increased in size and sturdiness on a whim – it was to hold a whole new chip inside.

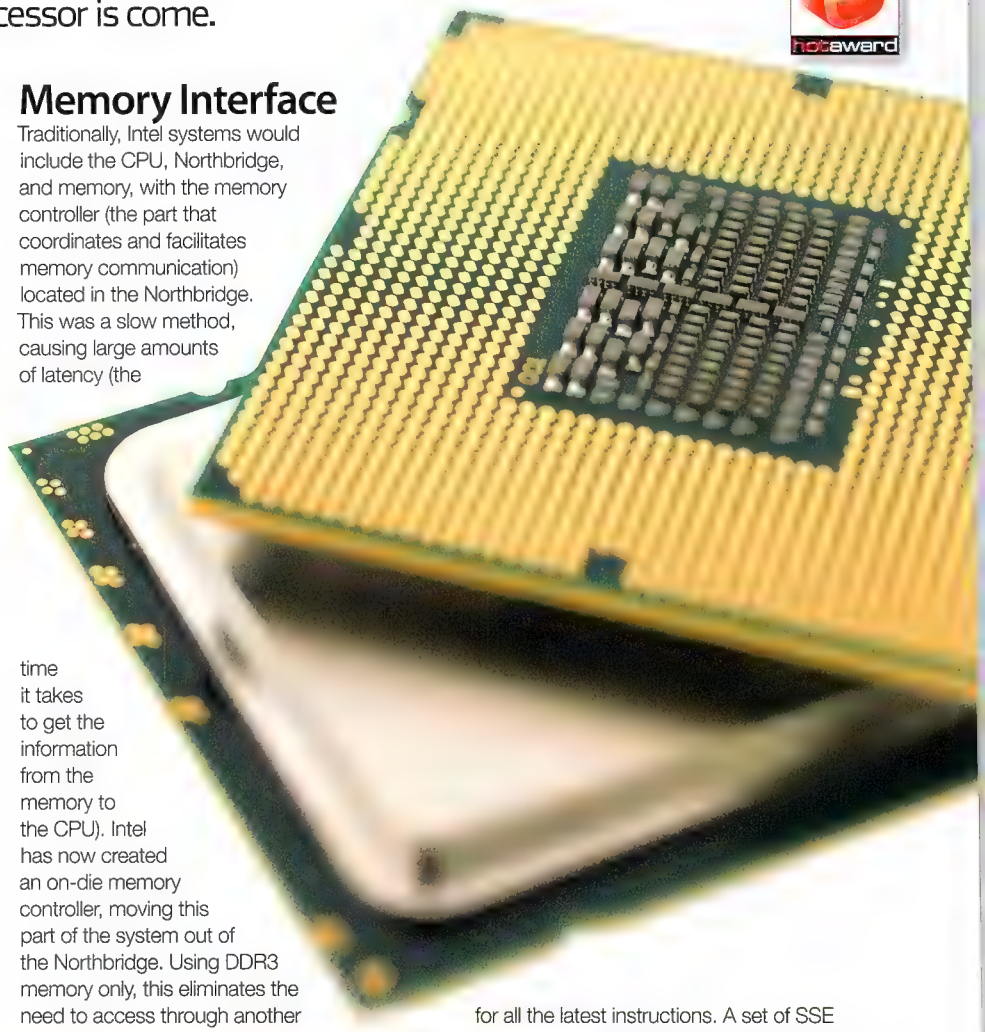
The new architecture follows a slight reworking of the previous Core 2 setup, starting with the Instruction Fetch and Pre-Decode stage. Here, the processor will retrieve the code, and then store it in the 32KB Level-1 cache, an incredibly fast cache located directly next to each core. This cache is fed by a 256KB Level-2 cache (and each core has one of these), and that in turn is fed by a shared pool of 8MB Level-3 cache, that each core can have more or less of depending on their needs, potentially giving a single core access to 8MB of cache.

The instructions are then passed through the Instruction Queue, and through the Decode stage. Here, a Branch Prediction unit attempts to 'guess' the possible outcomes of the current data, and allows the cache to load what data is most likely to be needed next into the L2 cache, saving time and increasing performance. After this stage, the instructions are decoded, and analysed by the Loop Stream Detector, which looks for repeating sequences in code and can store them for indefinite repetitions – essentially removing all the steps up until this stage.

The final step is to send the code to the Execution Units, whose task is to perform the calculations, which are temporarily stored in the final 32KB Data Cache until they're sent away for storage in either the L2/3 caches, or RAM.

Memory Interface

Traditionally, Intel systems would include the CPU, Northbridge, and memory, with the memory controller (the part that coordinates and facilitates memory communication) located in the Northbridge. This was a slow method, causing large amounts of latency (the time it takes to get the information from the memory to the CPU). Intel has now created an on-die memory controller, moving this part of the system out of the Northbridge. Using DDR3 memory only, this eliminates the need to access through another chip, and drops the latency by half, at the same time increasing bandwidth.



This is a massive increase over the previous Northbridge solution, and takes a leaf from AMD's processor playbook.

Not only that, but the memory controller has been upgraded, providing three channels of bandwidth with the system memory for theoretically up to 32GB/s. This is a massive increase over the previous Northbridge solution, and takes a leaf from AMD's processor playbook (who moved its memory controller onto the die some years previously).

Comprehensive SSE Support

With an updated architecture and platform, this also brings to the table updated support for all the latest instructions. A set of SSE instructions are a list of sorts that enables the CPU to understand and work with specific kinds of code more effectively. Nehalem supports all the SSE instructions up to and including 4.2, offering enhanced support for video codecs and encoding, with specific acceleration for Voice Recognition and DNA sequencing. It's obvious that Intel would love for its chips to be powering the future technologies, and with forward-thinking support like this, it's in the best position to take advantage of them.

Turbo mode, Engage!

The TDP (Thermal Design Power) of Nehalem is 130 Watts, which means that they are designed to make that much heat under heavy load. The problem with most applications today is that the CPU isn't stressed across all four cores, leaving room for extra speed. Turbo mode provides that extra speed, actively increasing the multiplier of the CPU on-the-fly to provide a speed bump of a few hundred MHz while still remaining inside the TDP.

Of course, increasing all four cores is great

QPI – A whole new FSBallgame

You're probably familiar (if not intimately so) with the FSB. The FSB, or Front Side Bus, is a method of connecting all the components on a motherboard with each other. This has been used in all Intel motherboards up until this point, and has proven to be a limiting factor in increasing performance, bottlenecking the amount of data that can be worked upon. It is also not very extensible, as each CPU or component added to the system takes a slice of the total bandwidth available, reducing the benefits of having two. The FSB also requires a very high frequency (333MHz is very common), and can place stress on some motherboard components. It's essentially an outdated tech, which has spurred on the evolution of the FSB's replacement – the QPI.

The QPI, or Quick Path Interconnect, is similar to AMD's HyperTransport, or HT bus. The HT bus is a bi-directional parallel link, and the last standard (3.0) provides a theoretical bandwidth of just over 40GB/s per second. QPI, along much the same lines, provides multiple links between each core of the CPUs, memory, and all the components on the board. Since this is not shared, each link is free to operate at the full bandwidth, allowing a core on another CPU access to memory data at a very fast speed. Current theoretical performance on an X58 motherboard of the QPI is just over 25GB/s. This might not sound like it's as good as AMD's, but here's the kicker – this is between every major component on the board, in any direction, at any time. In terms of real-world usability and viability, the QPI is a significant improvement, and Intel will surely encroach heavily on the Server market once these chips become available.

when you've got a multithreaded application, but what if you've got a single threaded app? Well, those crazy boffins at Intel thought of that too. In the event that a single core is furiously working through a particularly demanding application, and the other cores are idly sitting there wasting power, Turbo mode can effectively power these idle cores down and increase the speed of the single core – and stay within the TDP – increasing performance in these applications when needed. This alone is probably the most important trend that we'll see developing in the CPU design world, where the hardware itself will attempt to make allowances for inefficient or single-threaded programming.

Hyper-Space threading

Hyper-Threading was one of the major points of contention back in the days of the (now ancient) Pentium 4 era. It is a function of the hardware to analyse code, and to locate any repetitions that happen multiple times (the Loop Stream Detector takes care of this). These repetitions are then split into two threads, and pumped concurrently to a single CPU core. The reasoning behind this is that the core is never left idle between instructions, and can work through the code more efficiently. This is why you'll notice that Windows detects Nehalem as being an Octal-threaded Quad-core CPU. Applications that take advantage of this tech the most are video encoding and editing, as well as intense scientific calculations.

Testing Rig and Benchmarks

When testing a system like this, you really need the latest and greatest of everything. Thankfully, Intel knew this, and supplied us with the following, to which we added a power supply and graphics card:

- i965 3.2GHz Nehalem CPU (8MB, 133MHz QPI link, 45nm process)
- Qimonda 3x1GB DDR3 sticks (1067MHz, CL7)
- Intel X25-M 80GB SSD
- Intel DX58SO Extreme motherboard
- Thermalright Ultra 120 Extreme cooler with LGA1366 mounting bracket

Apart from being the kind of tech that you'd do unscrupulous things just to get a look at, we finally had a beefy test rig ready to rip through our benchmark suite like no other CPU has before – even heavily overclocked ones. All these tests, unless mentioned, were run at stock settings with Turbo Mode turned off.

Our first benchmark was *Cinebench R10*, which can be run in either singlethreaded or multithreaded mode. In a single thread, we got a score of 4,252, or about a hundred more than an E8600 at stock. When we ran the benchmark in multithreaded mode, we got a score of 18,321! Thanks to multithreading, we actually recorded an increase in efficiency of 4.31x over a single core – Hyperthreading was actually doing something useful!

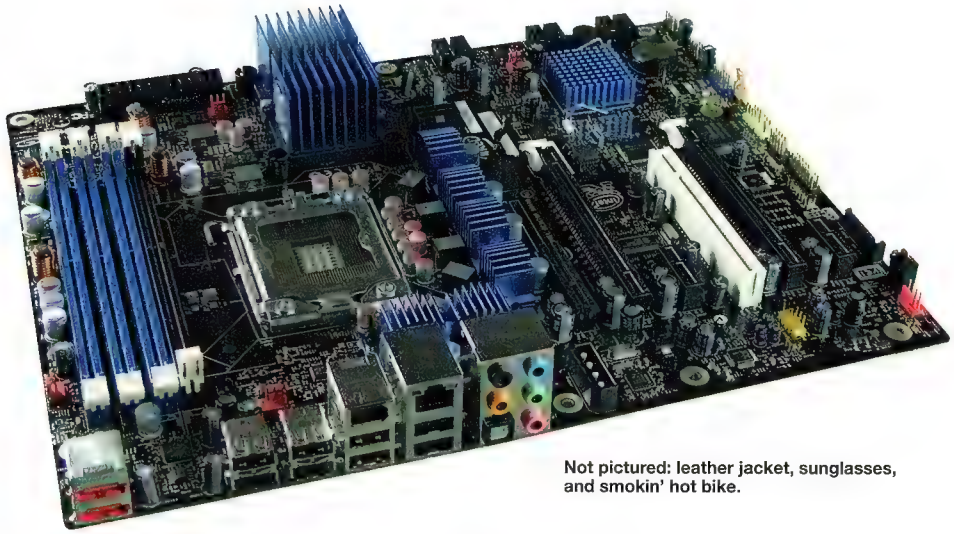
The next benchmark was *Hexus PiFast*, a singlethreaded application that finished in 27.56 seconds. This is about half a second faster than an E8600, showing us that these kinds of applications won't benefit much from Nehalem. Moving on to our third benchmark, *wPrime*, we recorded a single-threaded performance of 37.297 seconds, a 16 per cent performance boost over an E8600 – due to the huge amount of cache available to this CPU, the test is chewed through very quickly. When we enabled multithreading however, we had the entire test done in only 7.766 seconds, a speed boost of 4.8x over a single core! Hyperthreading is really working its magic here, with the same calculations repeated over and over able to be split into concurrent threads, keeping the CPU bursting to the seams with data.

Our final benchmark is *Everest*, a system information tool that also includes built-in memory benchmarks. We noted a huge memory read bandwidth of 14247MB/s, definitely a sign that the triple-channel memory and integrated memory controller are working wonders – this is much higher than the current dual-channel DDR2. Write speeds were also huge, the fast DDR3 able to write at 15438MB/s, with a latency of only 38.8ns! This means that the wait for data is quite literally halved, meaning that Nehalem can keep up with even the most demanding of programs.

So what about overclocking?

With the introduction of a new CPU, there's always the off-chance that it will be a dud overclocker. One that is so depressingly average that it refuses to be pushed, and simply throws instabilities and errors at you until you're blue in the face (most likely from the light of the BSOD on your screen).

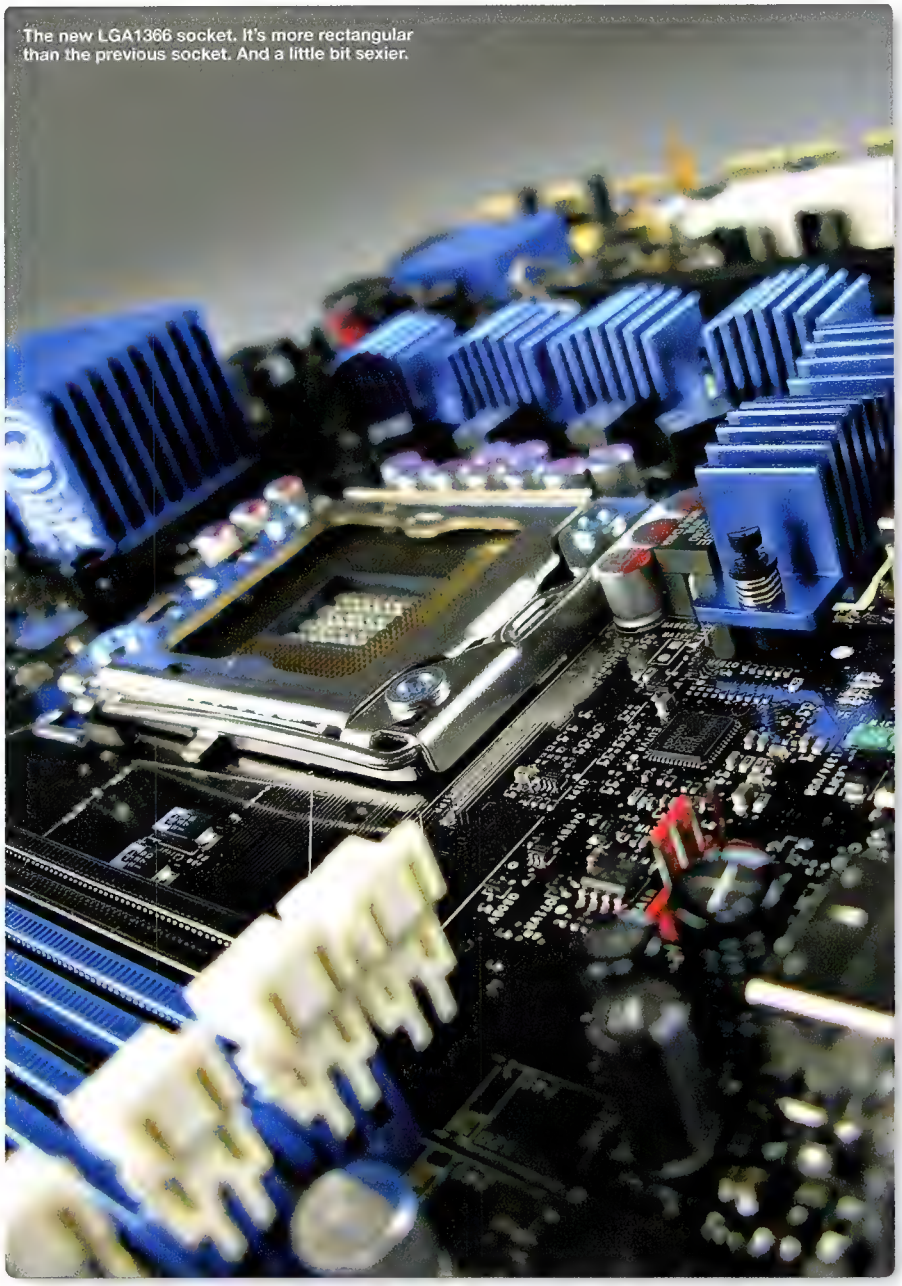
Thankfully this is not the case with Nehalem.



Not pictured: leather jacket, sunglasses, and smokin' hot bike.

High Voltage Memory Kills?

There've been many rumours floating around the internet that the current high-end DDR3 kits that require voltages over the JDEC specification of 1.5V will damage the memory controller on the CPU itself, and eventually burn it out. We got in contact with an engineer at Intel, and found the real answer – their limit on the CPU is 1.65V. You should be fine to run this level of voltage 24/7, without causing damage to the controller, though systems have been up to 1.8V without killing the CPU. It's still not a good idea to run at higher than 1.65V all the time, but for short overclocking sessions it should be fine.



The new LGA1366 socket. It's more rectangular than the previous socket. And a little bit sexier.

Overclocking is still performed through the BIOS, and is still easy enough that the thousands of people currently playing with their Core 2s will be able to play around with Nehalem in a very similar manner. The hardest barrier that we found was knowing where to add voltage to get the chip stable – once we found this, overclocking was a very pleasant experience.

Even though we know Nehalem doesn't use the FSB any more, it is still dependant on the frequency of the QPI bus to determine its working speed. So armed with our i965 and the 24x multiplier available, we set about pushing it in ways that Intel would like to pretend never happens. With a stock QPI frequency of 133MHz, this gives us 3192MHz (essentially 3.2GHz). Just like the FSB, all that's required to overclock Nehalem is to increase this bus speed, done by simply entering in a larger number in the BIOS. We bumped this straight up to 150MHz for a test run and found a few instabilities – so the Vcore was raised from a stock of 1.25V to 1.3V, bringing us into Windows at a very comfortable 3.6GHz.

Not content with that small bump, we sat down with this board over the course of a day, and coaxed the highest speed out of this chip that we could – 3.936GHz with a frequency of 164MHz. To get this stable, we had to add voltage to the core (1.4725V), the QPI link (1.3V) and the memory controller (1.28V). This was all done on air cooling, so expect much better results on water or subzero cooling – especially with the large amount of heat generated by all four cores.

Just like the FSB, all that's required to overclock Nehalem is to increase the bus speed, done by simply entering in a larger number in the BIOS.

Verdict: is Nehalem worth it?

The answer is a resounding yes! With performance increased over the current wave of CPUs by an extremely large margin, and multithreaded performance in excess of what we've ever seen from a multicored CPU, Nehalem is an amazing chip. While it will take a while for Nehalem to trickle down into the affordable range (the RRP of the i965 is likely something horrendous), the good news is that prices in other Intel chip ranges are already dropping – so even if you don't get Nehalem straight away you can still grab yourself some great performance thanks to this release.

We, for one, worship our new Nehalem overlords – and you should too. **JR**

Performance 100
There's simply nothing faster.

Overclockability 79
Not as flexible as we like, though this is pre-release kit.

Value 62
It'll leave a bruise in your hip pocket the size of WA.

Overall
Despite the cost, we still adore this chip for its incredible performance. In time, every enthusiast will need one.

90%

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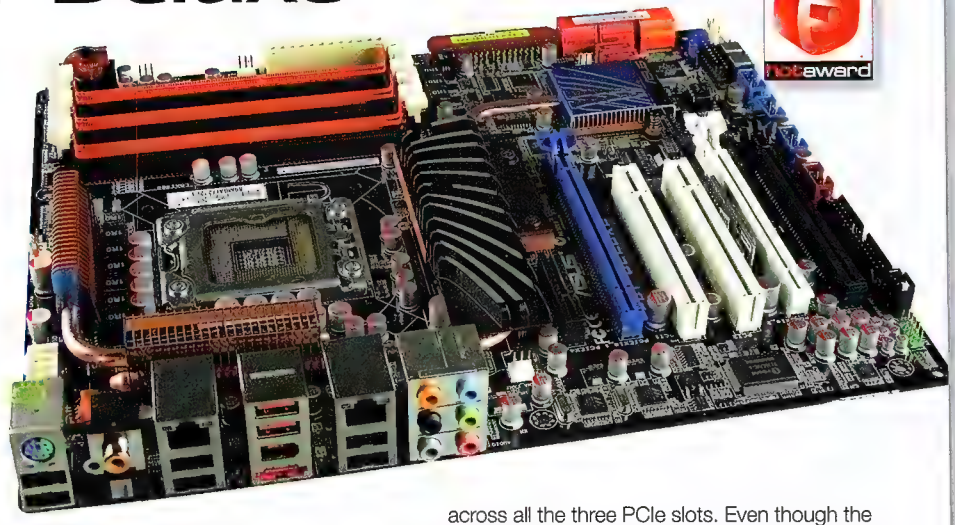


Price RRP$569 Supplier ASUS
Website www.asus.com.au
Specifications Socket LGA775; Intel X58 chipset; ATX form factor; 3x PCIe x16; 2x PCI; 1x PCIe x4; 1x EIDE; 6x SATA; 2x SAS; DDR3-2133

X58. We all want to have one, use one, and some of us even want to be one. So when ASUS tempted us with sweet promises of a look at this enthusiast-grade board, we had a duty to our readers to not only accept, but to tauntingly wave it at you. Okay, so now we've had our fun, it's on to the board itself.

Starting at the CPU socket (which is the new LGA1366, to go with the new Nehalem chip), an array of solid capacitors and ferrite chokes are arranged in neat groups, and out of the way of most heatsinks – clearance shouldn't be a problem. There are sixteen whole phases of power here, something so completely over-the-top that you'll never use it, but it's always nice to know you have it. In the usual place we have six DDR3 slots, each spaced just enough to allow larger DIMMs, and each channel occupies a single orange and adjacent black slot. That's right, triple channel memory is available on this board.

Along the right-hand side we have the board's battery, placed in an upright holster (extremely handy for those who overclock), the 24-pin power socket, right-angled IDE, four right-angled SATA, two upright SATA, and the rather amazing inclusion of two right-angled SAS ports (this is a server-grade storage interface, but is also backwards compatible with SATA). The 8-pin CPU power is in the top left of the board, as per usual.

In the bottom-right hand corner, we have onboard power and reset buttons, as well as all the frontpanel headers for switches, LEDs, and case ports. Also present here is the Marvell 88SE6320 chip that feeds those two SAS ports. Moving along the bottom we find a floppy header (which refuses to die a quick and painless death) and the audio header.

The expansion slot area is the usual affair, but has capacity for TriSLI or Crossfire – thanks to the NT200 chip and X58 chipset respectively. There's also an ExpressGate quickboot OS chip here, but this is only really handy for checking emails and light web use. Five fan headers are placed strategically on the board, giving you plenty of flexibility.

The back panel is decadently well-thought out with six USB, two Ethernet, 7.1 audio, Coaxial/Optical, Firewire, eSATA and a PS/2 port. This covers you for pretty much anything you'd need to plug in, without the annoyance of expansion cards.

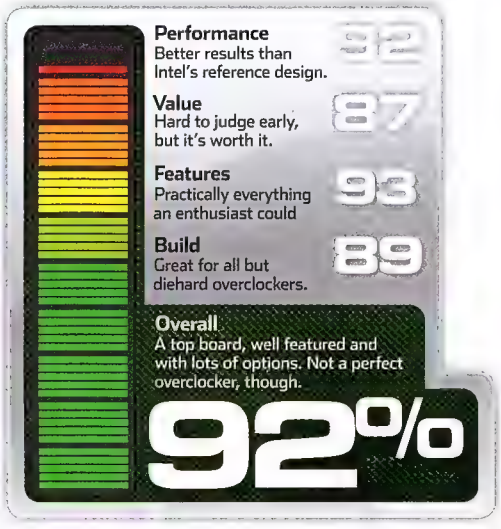
This board, as we very subtly alluded to before, has Intel's latest X58 chipset. This chipset is bereft of any memory controller, but has 32 PCIe 2.0 x16 lanes that allow Crossfire with full bandwidth to two of the slots. And if that weren't enough, there's also a NT200 chip present underneath the cooling array that adds another 16 PCIe 2.0 lanes, that allows Triple SLI across all the three PCIe slots. Even though the X58 chipset doesn't produce as much heat due to the removal of the controller, the heatsink array became quite warm under testing due to the large amount of power phases, as well as the added NT200 chip. Some airflow is definitely recommended (ASUS recommends a 40mm fan, with "Best for Extreme Overclocking!" In reality, a 40mm fan moves about as much as a butterfly's fart, so stick with a high-airflow fan, 80mm+).

Performance of the board was very good compared to the Intel Reference board, returning higher scores across all the benchmarks at the same settings. We were able to reach a maximum stable speed at a QPI of 166, giving us 3984MHz stably. We could POST up to 4.05GHz, but no amount of voltage would allow it to boot into windows at or over this speed.

Overall this is a great board, with a copious amount of opulent features for a very good price – expect to see this lower when the boards hit the streets.

ASUS P6T Deluxe

	965	133x24; DDR3-1066 7-7-7-20; 3.2GHz	150x24; DDR3 1066 7-7-7-20; 3.6GHz	160X24; DDR3-1066 7-7-7-20; 3.84GHz
PiFast		26.60s	23.57s	22.17s
wPrime 32M – single thread		36.88s	32.871s	30.901s
wPrime 32M – multi-thread		7.721s (4.77x efficiency)	6.896s (4.76x)	6.44s
CineBench R10 64-bit – single thread		4573	5096	5465
CineBench R10 64-bit – multi-thread		18458 (4.04x efficiency)	20850 (4.09x)	21370 (3.91x)
Everest Read		13384MB/s	14310MB/s	14127MB/s
Everest Write		11973MB/s	13439MB/s	14335MB/s
Everest Latency		38.9ns	38.0ns	36.4ns



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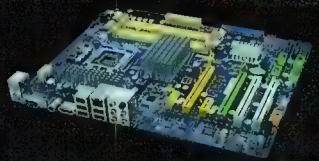

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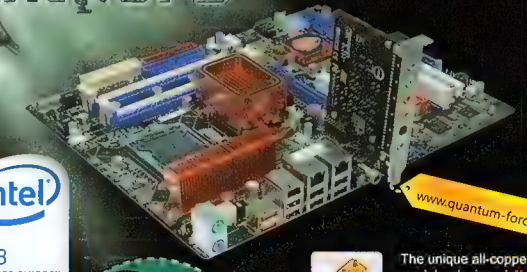
- 6* SATAII, 1* eSATA, 2* IEEE1394a, 12* USB2.0, 1* ATA
- Gigabit LAN
- 7.1channel HD Audio with multi-streaming

intel P45 EXPRESS CHIPSET



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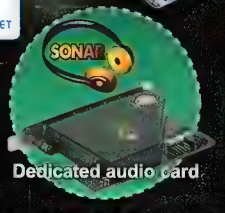

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14cm ball-bearing fan x 1 @800~980~1180RPM
With 3 speed fan controller
I/O Port: USB 2.0 x 4, IEEE1394 x 1, HD+AC97 Audio, E-SATA x 1
M/B type: E-ATX, ATX, Micro ATX
Dimension: 230 x 680 x 430mm (W x H x D)
Expansion slot: 8

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Bays: 5.25" x 2, 3.5" x1, 3.5" internal x 4
Fan: Front / 12cm ball-bearing fan x 2@1020~1240~1500RPM
Rear / 12cm ball-bearing fan x 2@1020~1240~1500RPM
With 3 speed fan controller
I/O Port: USB 2.0 x 4, IEEE1394 x 1, HD+AC97 Audio, E-SATA x 1
M/B type: ATX, Micro ATX
Dimension: 230 x 570 x 380mm (W x H x D)
Expansion slot: 7

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(use one 5.25" to 3.5" converter), 3.5"internal x 4
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14cm blue LED fan x 1 (@900RPM)
M/B type: ATX, Micro ATX
I/O Port: USB 2.0 x 2 / IEEE1394 x 1 / HD+AC97 Audio
Expansion slot: 7
Dim.: 210x450x490mm(W,H,D)

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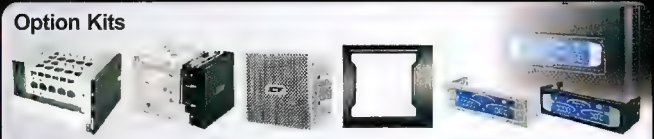

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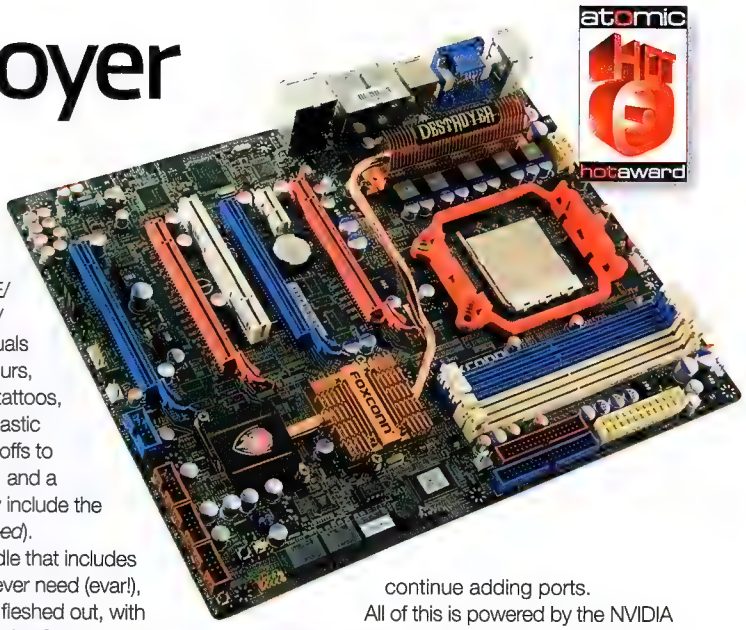


Price $450 **Supplier** Altech
Website www.altech.com.au

Specifications Socket AM2+; NVIDIA 780a chipset; ATX form factor; 4x PCIe x16; 1x PCI; 1x PCIe x1; 1x EIDE; 6x SATA; DDR2-1066

Throughout computing history, many comparisons have been drawn to other facets of society. Gamers, electronics geeks, and even scientists have been remembered for using excessive computer gear – but that's where Foxconn pushed the bar even higher. By going Naval.

The box for this motherboard is, by all normal reasoning, completely insane. Adorned with a battleship, it's twice the size of most normal mobo boxes – but comes with an equally impressive array of goodies inside. You'll get SLI bridges in Dual and Tri setups, a Foxconn branded 12cm fan, additional heatpipe/heatsink extension module, six SATA cables, SATA to molex power converters, IDE/floppy cables, Optical/Coaxial bracket, manuals in three separate flavours, cable ties, temporary tattoos, stickers, dogtags, a plastic sheet with large standoffs to bench outside a case, and a kitchen sink. Yes, they include the sink (no, they do not –*ed*).

Apart from the bundle that includes everything you could ever need (evar!), the board itself is very fleshed out, with plenty of room around the CPU socket to install large coolers. There's a decent amount of room around the memory slots too, but you'll have to remove the graphics card in order to interchange memory sticks. Both the 24-pin and 8-pin power connectors are placed very nicely, providing an easy cabling job for the budding builder. IDE, floppy and six right-angled SATA ports all lie along the usual side of the board, as well as a board-mounted speaker that is very handy for POST messages.

A plethora of headers are located in the bottom-right corner, giving access to the front panel connectors, as well as USB and Firewire. Audio is located along the bottom of the board, and is pretty accessible.

The expansion slots are pretty well organised too, with enough room for TriSLI and an extra card running PhysX, though this would almost definitely be heavily bottlenecked by the processor, and the fact that each lane only supports 8x electrical bandwidth when all four slots are used. Audio, Ethernet and all the usual add-in chips are located just next to these slots, providing quite a few of the inputs on the back panel.

This panel, naturally, has two Ethernet, 7.1 audio, six USB ports, two eSATA, one Firewire, a single PS/2, and VGA/DVI connectors. Apart from being very full, this amount of expansion provides enough ports for pretty much anyone, especially considering that you've got the USB headers onboard to continue adding ports.

All of this is powered by the NVIDIA 780a chipset, which contains an integrated graphics core that is DX10 compatible, and offers hardware acceleration of HD video. You'd have to be relatively mad to get a board like this without a graphics card, but it's still a nice inclusion. You can also pair this integrated graphics processor with either an 8400GS or 8500GT to give a small boost to performance, though we haven't found this to be amazing in our previous testing. As a rough guide, the performance of this core would place it as an 8200GS, so don't expect any kind of serious gaming from it.

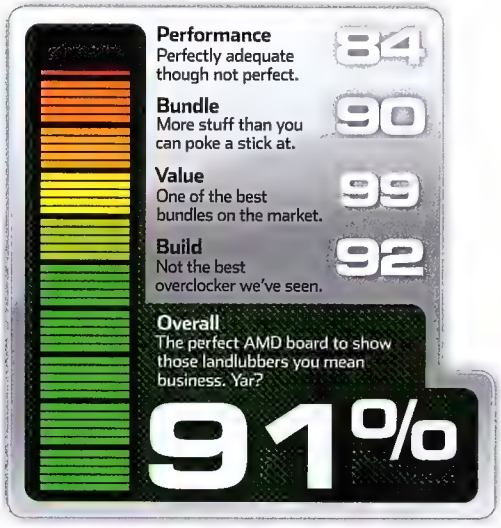
The BIOS options are complete, and include voltage controls for everything that you'd ever want to play with. Most things are clearly labelled, and those that aren't are explained quite well in one of the three manuals. Performance of the board was pretty good, though heat prevented the HTT bus being pushed much over 244MHz, giving an effective speed of 3172MHz. The full features are solid, though, making this an attractive purchase for any AMD fan. **JR**

What the...?

When you increase the HTT bus on this board, something very peculiar appears on the BIOS screen just as you tick over 230MHz. Check out the following list for the completely pointless rankings given to each stage (though they were good for a laugh):

231-238 – Recruit
239-246 – Backwash
247-253 – MidShipMan
254-261 – Flotilla Ahoy
262-269 – Choppy Sea!
270-276 – Dog Watch!
277-284 – Go Battalion!
285-292 – V Formation!
293-299 – Shellback!
300-307 – Rear Admiral
308+ – Jack Sparrow?

EDITOR'S NOTE: I cannot tell you the apoplexy these titles induced in me. Battalion? That's an infantry formation! Dog Watch? What does the last watch of the night have to do with anything?! Shellback? *ARGH!@11!1*



Foxconn Destroyer

Phenom 9950	200x10; DDR2-800 5-5-15-24	217x10; DDR2-866 5-5-15-24	230x10; DDR2-920 5-5-15-24
CPU Free Benchmark2	51.65	47.72	44.50
wPrime 32M	59.748	57.017	51.855
CineBench R10 64-bit – single thread	2122	2280	2425
CineBench R10 64-bit – multi-thread	5716 (2.69x efficiency)	6337 (2.78x)	6839 (2.82x)

ASUS 4870X2 TOP

An overclocked 4870X2? Is this madness?

Price $899 **Supplier** ASUS **Website** www.asus.com.au

Specifications 790MHz core; 915MHz memory (1830MHz effective); RV770 core X 2; 1600 shader units; 2GB GDDR5; 256-bit memory interface; dual slot PCB with active cooling; 6-pin and 8-pin PCIe power connectors

No, this is Sparta! Sorry, we couldn't resist. Seriously though, a factory overclocked 4870X2 is a very big deal 'round these parts, for many reasons. Firstly, you've got the somewhat tricky nature of two cores playing nicely with each other on the one board. Secondly, when you take two cores like that, put them right next to each other under a confined space, you get a lot of heat. And finally, to overclock these cores makes you relatively mad, since there's already so much heat, and overclocking will just increase that. Well, here's a card that defies logic and reason.

The ASUS 4870X2 has two RV770 cores, and a total of 2GB of GDDR5 memory on a 256-bit memory bus. This memory is split between the two cores, so you essentially only get a usable 1GB of space, but it's still extremely handy to have all that room (and great for anti aliasing with large textures turned on). You'll need a beefy power supply to keep this gear chugging along smoothly (this is a very subtle hint to turn to page 54), however, even more so if you want two of them.

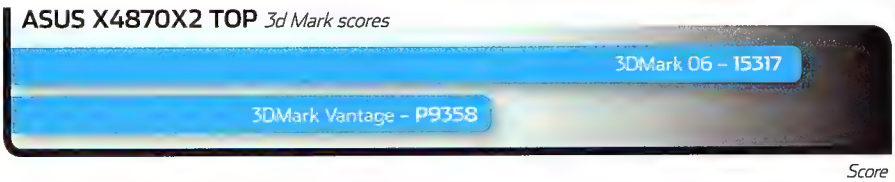
The cores have both been overclocked to 790MHz, which is an impressive 40MHz up over stock settings. This means that every single card is guaranteed to be run at these settings 24/7, and warranted to as well. Memory also gets a nice bump, though it's nothing really worth wetting oneself about. This is an interesting choice by ASUS, especially considering that when you increase stress on something, you also increase the likelihood of it not working.

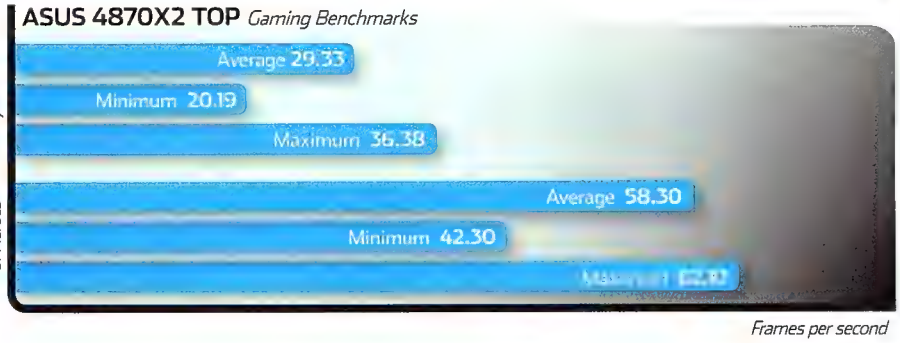
The stock cooler does seem to be doing a good job with the temperatures though, hitting a ceiling of 80 degrees and 67.5dBA at load. Idle isn't so great, with 68 degrees at 46.5dBA, but it is quieter than most other idle speeds. If you really don't care about the amount of noise generated, cranking the fan speed up in CCC to 100 per cent will give you an idle temperature of about 35 degrees. This can be very handy, especially if you need to remove your card – just cool it off before shutting down. Naturally, the cooler has a generic CGI woman on it, with a bow and arrow. We still don't really get what the connection is here, but you won't hear us complaining too loudly about it – unless we get arrowed in the chest.

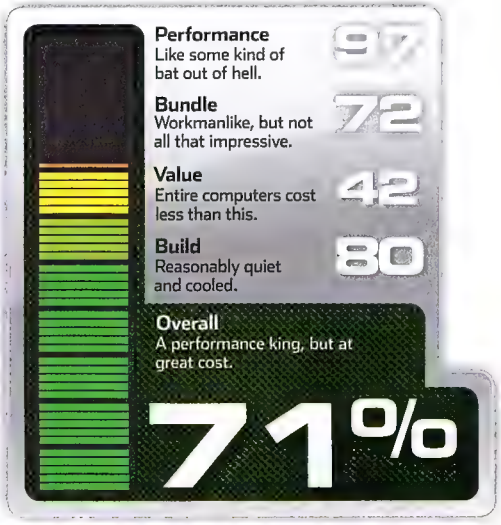
The bundle is depressingly light, with the power cables, DVI adaptors, driver disc and manual included. There's also a faux leather CD wallet, but for the price tag attached it could at least have a game thrown in as well. Even a benchmark would've been nice.

The bundle disappointment is offset slightly by the very nice performance, returning solid scores in all the benchmarks, especially *Company of Heroes*, though it falls down in *Crysis* for reasons that we couldn't work out. There were also graphical errors in one run of Vantage, but we couldn't get them again in a second round of testing.

All in all, this is a very fast card, but with that price tag you'll have to be exceptionally keen (or particularly careless with your money) to pick this card up. **JR**







GIGABYTE GTX260 OC

GIGABYTE's latest card with NVIDIA's latest core.

Price $450 **Supplier** GIGABYTE
Website www.giga-byte.com

Specifications 576MHz core; 999MHz memory (1998MHz effective); 1242MHz shader clock; GT200 core; 216 stream processors; 896MB GDDR3; 448-bit memory interface; dual slot PCB with active cooling; dual 6-pin PCIe power connector.

NVIDIA. You have to admire its brilliant scheme to sell graphics cards – simply rename existing ones or change them slightly, and people will be convinced that the cycle is moving forwards at an astounding pace. But with this new version of the GTX260, is it worth looking at over a vanilla offering?

Inside this card is a GT200 core, the same that has been used with both the GTX260 and the GTX280. This one, however, has bridged the gap in the amount of stream processors, offering 216 of them instead of the usual 192 (though still not close to the current highest at 240). This is essentially the only difference between the new GTX260, and the old one. So now we have the original card, in an overclocked version, the newer card, and again in an overclocked version, as well as the GTX280 in stock and overclocked versions!

Core speed remains at stock settings of 576MHz, and the memory sits at a comfortable 999MHz on a 448-bit memory bus. 896MB of GDDR3 memory provides a goodly amount of space for game textures, and has a decent amount of bandwidth to keep those ones and zeroes flying along.

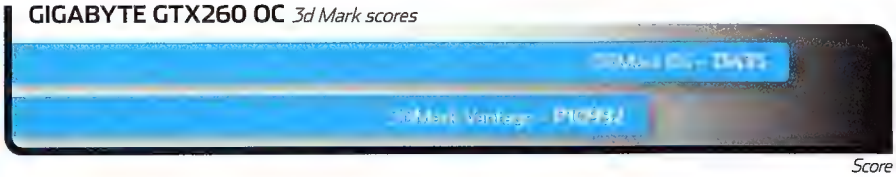
Speaking of long, the card itself is rather lengthy – double check your case innards before you buy! Covered in the black plastic framing that is indicative of a stock cooler (and adorned with a GIGABYTE sticker), it manages to keep a hold of temperatures and noise. Idle is 56dBA, with a temperature of only 42 degrees, while load is a louder 63dBA and 54 degrees. This is plenty of headroom to allow further overclocking, though don't expect miracles.

Performance over a vanilla GTX260 is improved across the board, with good benchmark results returned in most games. This isn't enough to spur an upgrade for those already with one of these cards, since performance is only a few frames per second faster, and it scores only a few hundred points more in both 3DMarks. For people with much lesser cards, this is a great choice, and does offer improved performance.

Unfortunately, the bundle is very light. You get the card, molex to PCIe power cable, manual, and driver CD (as well as the component video out cable), but no game or other accessory is included. We would have really liked to see something extra added here, even if it's only a copy of *Neverwinter Nights 2*. Or even…ugh, *Company of Heroes*.

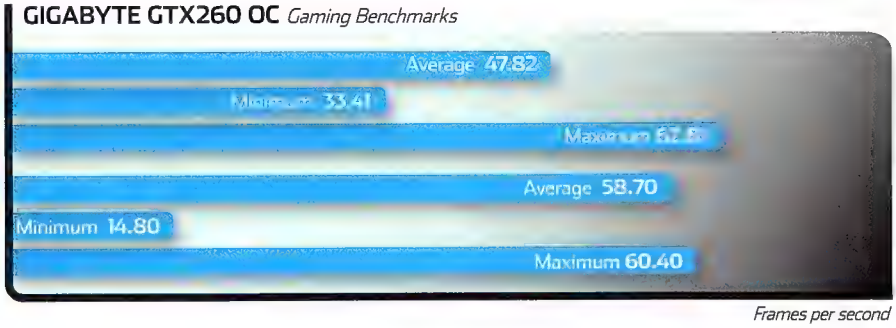
This isn't really a bad card, and has decent performance – certainly enough to push a cavalcade of pixels at your screen – but for the price and severely malnourished bundle this really isn't a great choice. When you take into consideration that the vanilla GTX260 can be grabbed for as little as $350, we really can't suggest that you grab this card. If prices come down, this might be a real contender. **JR**

GIGABYTE GTX260 OC *3d Mark scores*

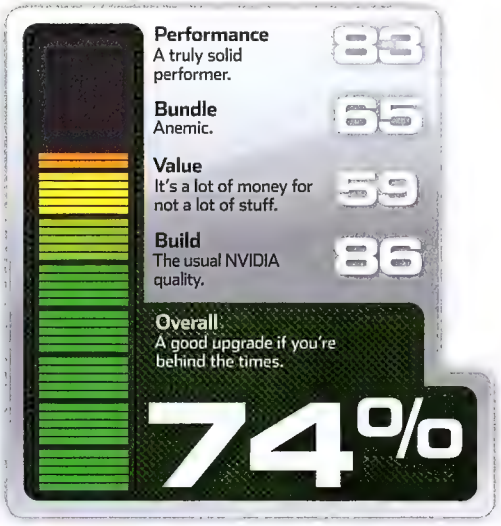


Score

GIGABYTE GTX260 OC *Gaming Benchmarks*



Frames per second



Sapphire HD4870 Toxic

Horrific mutagens, radioactive minerals and magic smoke contained within.

Price $525 **Supplier** Sapphire
Website www.sapphiretech.com

Specifications 780MHz core; 1000MHz memory (2000 effective); RV770 core; 800 shader units; 512MB GDDR5; 256-bit memory interface; dual slot PCB with active cooling; dual 6-pin PCIe power connector

When we first took a look at a Sapphire HD4870 back in Issue 92, we were suitably impressed with the performance. Now we look back at this heavily tweaked version of the same card, and find out if the extra money is justified.

With an RV770 core plugged into the board, and 512MB of GDDR5 oozing along a 256-bit memory bus, this card seems – at first – quite normal. It's only when you look underneath the hood that you'll notice that this beastie has been fed a terrible concoction of drugs and performance enhancements to get it moving at 780MHZ on the core (30MHz over stock) and 1000MHz on the memory (100MHz over stock). This is a relatively disappointing overclock, though, especially considering the large price tag that is growing grotesquely out of the card's shoulder.

Funnily enough, that isn't the only thing growing out of this card. Encased in an opaque black plastic shell (complete with sticker, of course), the cooler underneath is called the Vapor-X; this is essentially a large flattened out heatpipe that is attached directly to aluminium fins. There are also three large copper heatpipes skewering the top of the card, which might interfere with case fans in a particularly cramped environment. The PCB is the usual Sapphire blue, while the bracket is the usual vented dual-slot affair.

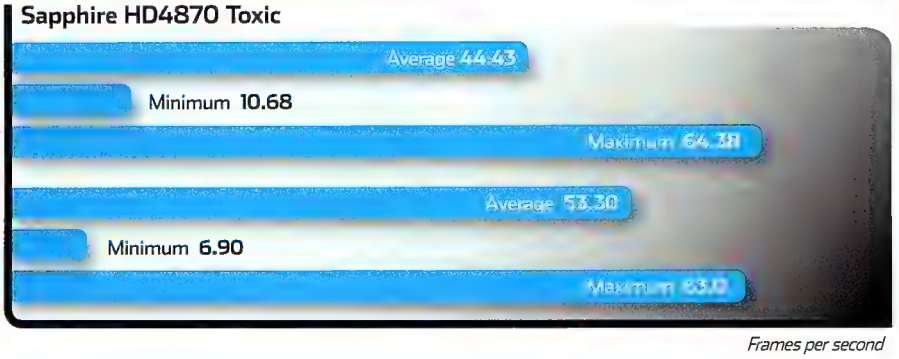
Cooling performance was quite impressive, idling at 48 degrees and 58.5dBA – going up to only 55 degrees at load! Sadly, this was at the expense of noise, which shot up to 69.4dBA. Thankfully the fan is controlled via the 4-pin PWM cable, so you can easily play around with these settings using the Catalyst Control Center if you find it's too loud.

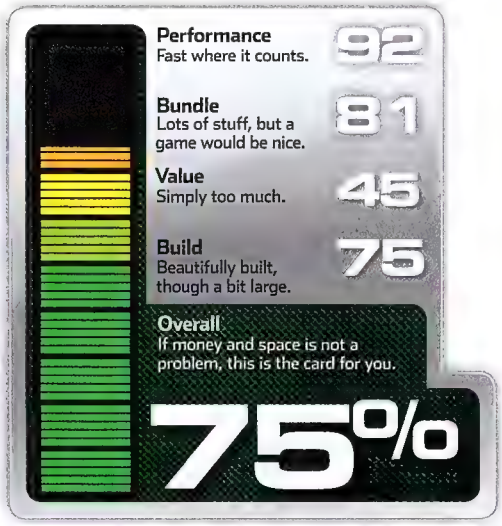
Gaming performance was pretty good, with solid framerates giving a smooth experience. Benchmarks were devoured by the card's voracious appetite, and were left mauled (but thoroughly evaluated). While performance is quite good, and we're certainly not complaining about that, it's not really all that much over a reference design to bother with.

The bundle with this card consists of the usual power cables, DVI adaptors, driver CD and a manual. There's also basic video editing software and DVD playback software included, and a copy of 3DMark Vantage Advanced. This bundle is bellowing out for a game or two to flesh it out, because there really isn't all that much here to get excited about. Give us what we really need – value.

The only difference between this card and the one in Issue 92 is the presence of the cooler, and a slight overclock. For an extra $200, this doesn't really scream "buy me now"; rather, it will just sit on the shelves screaming until the price is low enough to actually justify paying that much for the card – especially considering that if you can justify it, a 4870X2 isn't going to cost you too much more.

We can recommend this card to anyone looking for something that will suck inordinate amounts of money away from them, or someone looking for a good cooling solution with a warranty that doesn't involve water cooling. Everyone else – grab a reference design and an aftermarket heatsink, and you'll be right as rain.





msi NOTEBOOK

MSI recommends Windows Vista® Home Premium

Windows Vista Home Premium

Some people just play games. Others live for them. If you like games, we think you'll love them on Windows Vista®. So get into the game.

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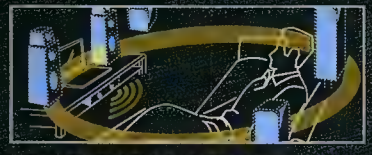
Exclusive ECO Engine Power Management System

Tom Clancy's RAINBOW SIX VEGAS 2

Tom Clancy's Rainbow Six Vegas 2 © 2008 Ubisoft Entertainment (Optional)

NVIDIA Geforce 9600M GT 3D Graphic Card (Build-in 512 MB VRAM)



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MSI GX620 powered by Intel® Centrino® 2 processor Technology

XFX 9600GSO

A card that is high on X, and life.

Price $150 **Supplier** XFX **Website** www.xfxforce.com

Specifications 680MHz core; 950MHz (1900MHz effective) memory; 1700MHz shader; G92 core; 96 stream processors; 384MB GDDR3; 192-bit memory interface; single slot active cooler; six-pin power connector.

There has been a trend in recent years to remove the amount of X's out of a product's name. Thankfully there is one company who has stuck to their course, applying liberal amounts of X in a holistic way to thousands of graphics cards each month. But does increased X mean better performance?

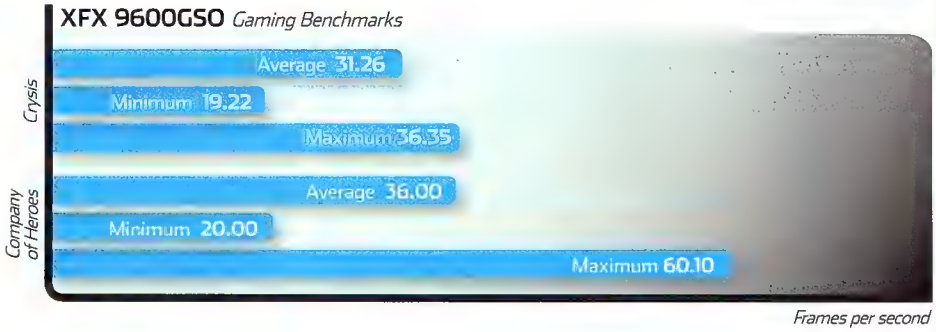
This X, err, 9600GSO, is built around a cut-down version of the same G92 core that we've seen extensive use in the 8800GT and 9800GTX/+ series cards, so we know it's got a little grunt under the hood. Running at a stock overclock of 680MHz on the core (130MHz over stock!!), and a memory speed of 950MHz, this card has the clocks that are destined to rock your socks. Of course, all the clockspeed in the world would mean absolutely nothing if they didn't have a 192-bit memory bus keeping the hungry stream processors sated with delicious chunks of memory data, of which there is 384MBs worth of GDDR3 – plenty of space for gaming, albeit at lower resolutions.

We'd be lying if we told you that the card didn't look good. From the black support bar running along the top side of the card (great for showing off all your Xs in a windowed case), to the matte black PCB, anodised dark grey PCI bracket, and black stock cooler. Thankfully, there's also some colour here too, with acid-green DVI ports, and a stock cooler with a rather exciting number on it. The dinky little fan on the cooler doesn't do a bad job of keeping temperatures or noise down either, with an idle of 62 degrees at 48.4dBA, and a load of 81 at 59.5dBA. This is a little on the toasty side of well done, but it's probable that you'll be able to wring a little extra performance out of this card without swapping to aftermarket cooling.

While we're on the topic of performance, this card performs quite swimmingly in all of our tests – it's just a shame that it performs at the level of an amateur swimmer (though this is expected due to its midrange nature). You'll get a decent playing experience in Crysis and CoH, though you'll have to turn the settings down in each if you'd like to have a rock-solid 30fps framerate.

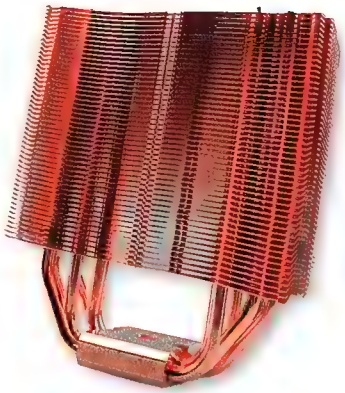
The bundle for the card is quite decent as well, with a copy of 3DMark Vantage Advanced included (worth about US$20), as well as all the power cables, manual and driver CD. While a game would have been a handy inclusion over a benchmark, it's still much better than nothing at all.

If you're a gamer who wants a good, light, and relatively powerful LANing system, this card is a very good choice. If you're a vain image-obsessed colour-coordinating person, then this card is also good for you (and will go well with the drapes). What you won't find here is the best performance. If you're serious about performance, you're going to have to look elsewhere. **JR**



TRUE 120 Copper

For when you need almost two kilo of pure awesome.



Price US$110, limited run of 2,000
Supplier Thermalright **Website** www.thermalright.com
Specifications Tower cooler; 6x 6mm heatpipes; compatible with up to two 12cm fans

For over a year Thermalright has led the pack in air cooling with its Ultra 120 Extreme. So when we heard that its boffins had taken that same design, and decided to replace EVERYTHING with copper, we knew we just had to get one in!

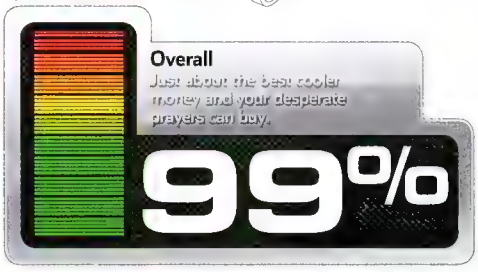
Standing 15.6cm tall, and glistening all over, it's easy to see why anyone would love this cooler. A total of six 6mm copper heatpipes are bent into a 'U' shape, and meet at a pure copper base (that is so reflective you can use it as a mirror – not to mention that it's perfectly flat). These carry the heat upwards, meeting the 52 pure copper fins, spreading the heat over a very large surface area.

The mounting system for such a huge cooler is the same as the original, and is compatible with AM2, LGA775, and has an optional bracket for LGA1366. While this is a lot of weight, the mounting system held it relatively secure – though you'd probably want to use this with an immobile system, as moving the computer too much might cause damage to your mobo.

Performance was, as could be expected, amazing. Just take a look at the table below to see that stock speed temperatures were significantly improved, and even overclocking became noticeably cooler. It looks like we have a new performance champ – with only one drawback. They're only making 2,000 of them worldwide, so to get your hands on one you'll have to plead, beg, and some other third thing just to be able to see one. JR

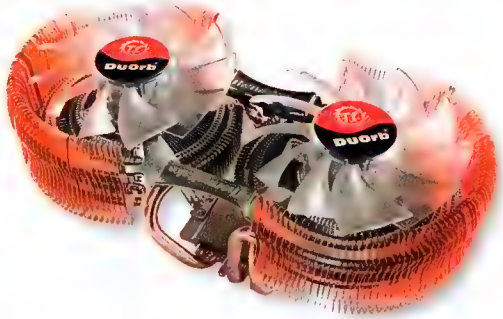
Thermalright TRUE Copper

	Thermalright TRUE Copper		Thermalright Ultra 120 Extreme	
	Load	Idle	Load	Idle
3GHz, 1.325V	51	32	60	36
3.66GHz, 1.45V	68	40	70	42



Thermaltake DuOrb CPU Cooler

For when your computer doesn't have enough red or blue light.



Price $90 **upplier** Anyware
Website www.anyware.com.au
Specifications Peanut-style cooler; six 6mm heatpipes; two inbuilt 80mm fans

Red and blue lights are usually a tell-tale sign that you're in trouble with the law. Thankfully, this cooler doesn't want to arrest you for your wrongdoings (as heinous as they may be), but rather wants to sit on top of a heat source and radiate it into the surrounding air.

The first step of that process is a copper/aluminium base, into which six heatpipes are inserted. Three of these are bent upwards, and then curved around to form a mostly complete circle. The other three complete the other side of the cooler. Wrapped around these pipes are an outer array of copper fins, and an internal array of aluminium (presumably to cut costs).

An 80mm fan is nestled in the center of each circle, sucking in air and blowing it through the surrounding fins. It's also a very good pen launcher, though don't tell anyone that we told you. Each fan is screwed in, so if one dies it should be relatively simple to replace it.

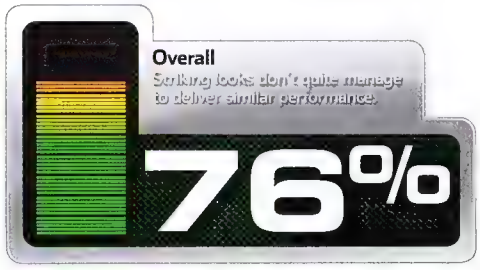
At stock speeds this cooler performs quite well (and looks rather dashing), but when we put it under the torture test of an overclocked and overvolted Quad in OCCT load, it crashed when the temperature reached 80 degrees.

This is partly due to the poor flatness of the base, as its concavity caused such a bad CPU contact the first time we mounted it that temperatures briefly reached 95 degrees! We added more than the usual thin layer of thermal goop and things worked much better. Keep in mind that if you're going to use this cooler, particularly large sticks of RAM simply won't fit underneath it. You do get the added benefit of chipset and motherboard cooling, however.

We recommend this cooler if you're into something a little out of the ordinary. JR

Thermalright DuOrb CPU Cooler

	Thermaltake DuOrb		Thermalright Ultra 120 Extreme	
	Load	Idle	Load	Idle
3GHz, 1.325V	63	36	60	36
3.66GHz, 1.45V	80 -Crashed	47	70	42



Coolermaster ATCS 840

A well made and sturdy case for the enthusiast who wants a LOT of room.

Price $330 appr. Supplier Coolermaster

Website www.coolermaster.com

Specifications: 243 x 580 x 630mm (W x H x D); 13.25kg; 1x 230mm fan (front), 2x 230mm fans (top), 1x 120mm fan (rear); External air duct (rear); 6x 5.25in bays; 6x 3.5in bays; Micro ATX, ATX, and E-ATX compatible; Aluminium.

We hold the unboxing of new tech to be a nearly sacred moment here at Atomic HQ. Quiet descends over the labs as new gear is brought out, hymns play in the background, and incense burns in holy respect of kit as we all ooh and aah. And boy, did we ooh and aah at the ATCS 840.

This a full tower case in the classic mould. Tall, square, but with rolled aluminium edges to add strength and a few softening curves. The black brushed aluminium is attractive, but we did find it was a real fingerprint magnet. Mind you, that's only a problem if you compulsively stroke your PC. Like us.

What? It's normal!

Nice and chunky thumb screws secure the side plates, and once you slide both off you're treated to a view of enthusiast beauty. Airy, open and fully featured, the ATCS's interior is bested only by the space and features of the Lian Li X-2000 reviewed in issue 91, and features in our KitLog. There are six each of 3.5in and 5.25in drive bays, though one of the latter has brackets for a floppy drive. Why, we don't know. Perhaps you're retro. Nothing wrong with retro.

The standard Coolermaster push-button system secures optical drives and such without the need for screws, and a new, clip-in mechanism secures HDDs in a similar manner, while also allowing them to slide straight out of the case, rather than into the interior and then out. Very handy if you're a habitual drive swapper.

All edges are nicely rolled metal, and there are swappable backplates to enable installation of PSU and watercooling rigs on the top or bottom of the case. The slide out mobo tray is a lovely touch, and works very smoothly. The tray also has a lot of clearance, allowing for excellent cable management by routing it behind the board. Similarly, all the IO cabling is nicely bundled out of the way, with room enough for everything else to be neatly folded, cable-tied or spit and bailing-wired.

It's a cool and quiet case, too, with a mess of 200mm fans to push air around with ease. All of the open space this case offers really comes into play, here, making this ideal for a serious gaming machine with a raft of ATI's latest, greatest – and hottest – cards. There's even a plastic housing to slip over rear of the expansion slots, to which you can add another 120mm fan.

This is a case that's easy to love, and easier still to do a lot of serious computing with. **DH**

Travel tough

You might have noticed the dent in our ATCS's side-panel. There's a matching one on the right hand side, leading us here to think that the case was either jammed between two oddly shaped objects in transit, or possibly damaged by some form of giant robotic claw (we know which version we prefer). This is annoying, as it mars an otherwise lovely case, but look at it this way. Those dents are very sharp and pronounced, suggesting rapid application of force. Force heavy enough to dent the aluminium quite heavily. And yet the internals of the case are fine, undamaged, and still structurally sound. Now that's impressive build quality.

Performance 92
Near perfect features and quality.

Value 86
Great features for the price.

Cooling 93
Good fan placement, and options liquid.

Features 89
All it needs is hot-swappable.

Overall:
Look out Lian Li, Coolermaster's on the warpath.

91%

Thermaltake V9

Also required – rope to secure case against slight breezes.

Price $115 **Supplier** Anyware
Website www.anyware.com.au

Specifications 208 x 462 x 485mm (W x H x D); 1 x 120mm LED Fan (front); 1 x 230mm Fan (top); 1 x 120mm Fan (rear); 4 x 5.25in drive bay (external); 2 x 3.5in drive bay (external); 5 x 3.5in drive bay (internal); ATX, M-ATX; SECC Steel with windowed panel.

Thermaltake has taken large strides in recent years, aiming to provide full-featured cases for a very appealing price. Today we're looking at its V9 case, which we're relatively certain has almost nothing to do with engines.

The front of the case is quite traditional, using mesh everywhere to allow plenty of airflow. A 12cm red LED fan sits at the bottom, sucking in cool air (and giving off a decidedly beastly glow too). Moving to the top of the case, there is a little plateau right underneath two USB and audio ports that is handy for keeping keys, your MP3 player, or even a makeshift food bowl for your cat. The power and reset buttons are along the top front of the case, and have a very responsive 'clicky' feel to them. Further along the top, there is a large meshed area with a 23cm fan underneath, and while this doesn't provide as much airflow as you'd hope, it is quiet when running.

Looking at the backside of the case, (yes, we believe that *is* the technical term) it is quite bare, with only a 12cm fan and a pair of small-diameter, very cheap feeling watercooling grommets of note. The right-hand side panel is vented at the bottom (to bring in air for the HDD bays), and also at the top – you've got the option for a 15mm wide 8cm fan here, blowing at the back of the motherboard.

Thankfully the left-hand side panel is more interesting, with a 'backslash' shaped window, and some vents. Unfortunately, this window (and the entire case) is about as thin as cellophane, and conjures up Rolf Harris-style thoughts of using the panel as a makeshift wobbleboard!

The inside of the case fares a little better, with plenty of room to work inside. Each drive and HDD is held in by a black and red plastic tool-less mount, which makes it easy to install these quickly (though they are quite fragile, and might break if you're not careful). Thoughtfully, the external 3.5in bays have been recessed just far enough that extremely large cards will fit just fine without drives installed, though you'll only be able to have a single long card. Little soft rubber caps have also been placed on all the major corners, protecting your skin from the razor-thin cuts of yesteryear.

Yet another downfall is the PCI bracket mounting system, which consists of thin plastic rods that slide into the mounting holes on the expansion cards, and could never hold anything securely – even while stationary. We heartily suggest that you remove this (done via three screws), and secure the cards with screws instead.

Overall, this isn't a bad case, and includes some decent features for the price, but won't touch the quality of more expensive products. **JR**

Build 70
Paper-thin steel walls, thoughtful touches.

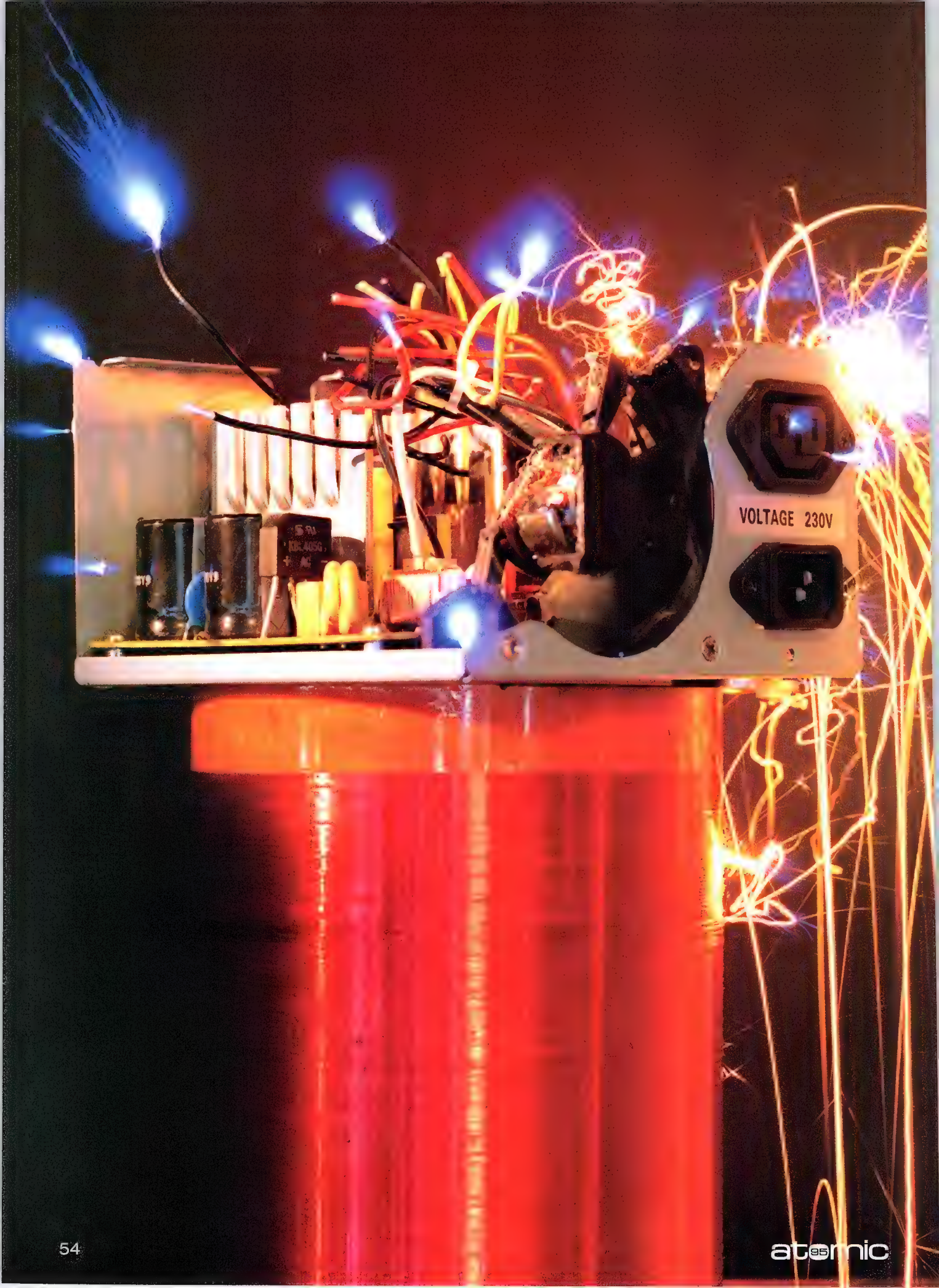
Value 80
You'll get quite a bang for your buck

Cooling 85
A decent amount of airflow.

Features 69
Includes a bevy of interesting doodads.

Overall
A case with quirks, but if the price is right you'll be quite pleased.

76%


VOLTAGE 230V

Absolute power

Corrupts absolutely? Well, nothing can corrupt Big Willy, our purpose built PSU test machine from hell!

Your PC is growing.

There was a time when 500 watt power supplies were considered excessive and awesome. They were bought mostly by people with dual socket processors and plans for blitzkrieg-like expansion and were revered by all.

You'd be hard pressed to find anything less than 500W on the shelves now. My how times have changed and other such clichés. Welcome to the relentless pace of technology, gentle reader.

Your computer's second graphics card, fridge (**tinyurl.com/5fr95g**) and old IDE hard drives that you can't quite bring yourself to image and throw away aren't going to power themselves. And what about that Crossfire or SLI rig you've been considering? Surely that will need all the power in the world.

Or will it?

Thermaltake demonstrated a 2000W power supply at CES a while back, and 1500W PSUs are now being pushed onto us geeks. Should you be worried that you'll need to run extension leads from different parts of your house into your PC just so you don't trip a circuit while playing Crysis?

What should we make of the silly end of the power supply game? How much do you need? Which ones are any good? Are there any PSUs that are lying to you about their capacity? And at what point exactly can you expect the various high power PSUs to crap out on you?

Glad you asked. We thought so too. And we're going to find out. We're going to find out the proper way.

A rationale for testing

We thought about our setup long and hard. Sure, we could have done it like some other magazines and sites out there, and strung together a bank of resistors and switches. But then we'd have a static load that resembled a bunch of cinderblocks embedded in chickenwire. It wouldn't just be a synthetic test, it would be a static one too.

We're testing *computer* power supplies here. Computers are not static loads and don't draw power like an array of resistors. They draw varying amounts of power depending on how hard they're working at any given moment.

When a computer starts, so do the DC motors in fans and hard drives. Starting a DC motor takes more power than keeping it running. The capacitors and inductors that litter motherboards have to be charged on startup, which creates an inrush of current. In practice, it means the 12 volt line sags on crappier PSUs. Best believe we'll be pointing this out if and when it happens.

And that's just during startup. When you're playing a game and your GPU silicon needs to render unpredictable frames, it asks for epic amounts of current. More than your motherboard can supply in fact – which is why so many additional 12 volt lines get hooked into it directly from the power supply.

Nope. A static load wasn't going to cut it. So we built something that would.

How We Tested: Big Willy

If you want a load that reacts like a computer and can sink a massive amount of juice, the best option is to build a massive computer.

Say hello to Big Willy.

It's half nutcase gaming rig, half storage server and all insanity. We joke that it uses 0.486 rainforests per day whenever anyone in the office mentions green computing.

We're using an ASUS board based on the X48 chipset, which gives us two PCI-e 16x slots and a PCI-e 1x slot to play with, as well as eight SATA ports. And we're happy to report that we managed to max them, as well as the rest of the board, completely out.

We started with an Intel quad core QX6850, the fastest quad core that was manufactured on the 65nm process. We chose this in the name of energy inefficiency. We aimed Stress Prime at two of the cores to saturate them with work, leaving the other two there for other tasks. Stress Prime uses fast Fourier transformations to calculate positive prime integers that are one less than a power of two, and decimates processors in its wake.

In the 16x sockets are two ATI Radeon 4870X2s. These cards contain two of the highest end graphics cores available on one PCB, as well as a hardware Crossfire bridge that makes them appear as one card. Initially we had planned to run Folding@home on all four cores, however the GPU folding client has to address the GPUs individually, and the hardware Crossfire bridge prevents this. If you run it, you see 50 per cent usage on the card, and if you probe GPUs, you can see one processor working at 100 per cent and the other at zero.

We decided to use 3DMark Vantage instead, because it scales quite well across four GPUs and makes the cards sweat like they should. We ran a few loops of 'New Calico', its second GPU test, with every setting at extreme, and the resolution at 2,560 x 1,600 – the maximum we could pump into a 30in Dell monitor. We saw all the GPU cores running at between 70 and 85 per cent during the test. So far the four cores on the CPU run at about 70 per cent between them. But there's more.

In the board's last remaining PCI-e slot is an Adaptec 31605 SAS card. It can talk to both SATA and Serially Attached SCSI drives. It can connect directly to 16 hard drives or, with extra hardware, 128. It has its own processor that gets damn hot. It belongs in a server. Attached to this are 16 Western Digital 500GB hard drives divided into four RAID5 setups. There are another eight connected to the motherboard, taking Big Willy's total to 24. But what to do with them all?

We ran IOMeter in the background, which thrashes the hard drives by queuing commands for them to complete. And it feels good to do that on four different RAID5 setups simultaneously.

There's 4GB of DDR3 in there, too. We tried to build a bigger computer. We really did. But we ran out of I/O.

So we plugged in 14 fans. Nine for the hard drives, one for the SAS card, three for the GPUs and one on the CPU's heatsink.

Big Willy, without the power supply, would retail for – wait for it – over $9000(!).

Don't even try to act like you don't want one.

Power supply Specifications

	Gigabyte 850	Antec 1000	Amacrox 1000	Cooler Master Ultimate 1100	Corsair 1000	Enermax 850
Price	$235	$269	$320	$360	$359	$259
Drives supported	18	17	17	24	24	24
Quoted Wattage	850	1000	1000	1100	1000	850
PCI-e 6/6+2 pin	1/3	2/2	2/2	5/3	1/2	3/3
Modular?	Yes	Yes	Yes	No	Yes	Mostly
# of 12V rails	4	4	4	6	2	5
Weight	2.6	2.9	2.4	3.1	3.3	4
Average voltage during startup:						
12	11.921	11.631	11.813	11.600	11.619	12.123
5	5.102	4.742	4.843	4.899	4.847	5.009
3.3	3.274	3.267	3.235	3.308	3.290	3.346
Average voltage while idle in Windows:						
12	11.935	11.662	11.986	11.706	11.633	12.131
5	5.100	4.726	4.924	4.869	4.835	5.006
3.3	3.328	3.298	3.273	3.301	3.290	3.346
Average voltage during benchmarks:						
12	11.950	11.647	11.922	11.680	11.613	12.117
6	5.103	4.713	4.935	4.863	4.831	5.000
3.3	3.424	3.283	3.258	3.283	3.275	3.343

The method?

A PSU is strapped into the test bench.

We boot with all the hard drives attached. If it fails, we unplug a hard drive and boot again. Loop until boot is satisfied. Bake until golden brown.

Once we're satisfied that the system is stable, we note the number of drives that remain plugged in that can all be started at once in a spreadsheet that will soon explode into megabytes of further results.

We have three reasonably expensive multimeters that log results to their own CSV file every half second. We use them to probe and log the voltages on the 3.3, 5 and 12 volt rails for a few minutes under three different scenarios: as Big Willy starts up, sits idle in Windows and runs through our tests.

From there, we average out the results, observe the startup voltages over the first ten seconds, and write everything we know about them...

Show your working

If you hit **www.atomicmpc.com.au**, you will find an Excel spreadsheet with all the results that we've gathered during this roundup. Feel free to check it out to see half-second by half-second results of how all the power supplies fared during our tests.

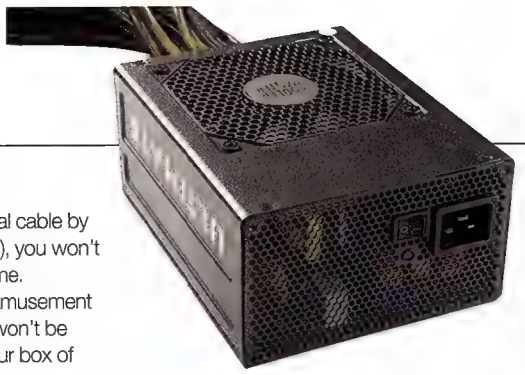
We'll be testing more power supplies as they arrive in labs – and we'll be updating this file as we do so. Check back in with us online to peer into some of the most horrendously detailed results you'll find on power supplies anywhere in the world.

Power supply Specifications

	Huntkey 700	NRP 1500	Seasonic 900	Tagan 1300	Thermaltake 1200	In Win 1500!
Price	$169	$399	$269	$369	$379	$459
Drives supported	See review	19	See review	19	24	20
Quoted Wattage	700	1500	900	1300	1200	1500
PCI-e 6/6+2 pin	0/2	4/4	4/0	3/3	3/3	4/4
Modular?	No	Yes	No	Yes	Yes	Yes
# of 12V rails	4	4	4	6	4	4
Weight	2.4	3.4	2.4	3.4	3.4	3.4
Average voltage during startup:						
12	11.638	N/A	11.510	12.082	11.561	11.866
5	5.058	N/A	5.031	4.854	4.762	4.872
3.3	3.346	N/A	3.344	3.370	3.288	3.223
Average voltage while idle in Windows:						
12	11.768	11.370	11.522	12.090	11.578	11.884
5		4.792	5.031	4.835	4.743	4.871
3.3	3.343	3.241	3.342	3.347	3.287	3.227
Average voltage during benchmarks:						
12	11.690	11.378	11.506	12.099	11.582	11.890
6	5.091	4.783	5.031	4.830	4.730	4.861
3.3	3.330	3.227	3.340	3.69	3.271	3.205

Cooler Master Ultimate 1100

Ultimate power for any hardcore rig



Price $360
Supplier Cooler Master
Website www.coolermaster.com

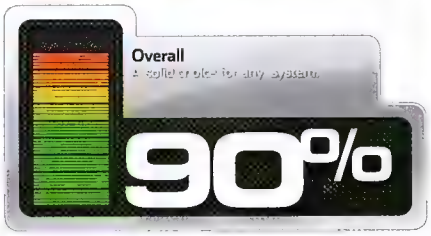
It wins (in equal place with two others) the game of Big Willy. Sadly, we've got a few reservations about it. You see, the Cooler Master Ultimate 1100 uses a strange, non-standard power socket which can handle 16 amps instead of the normal 10 amp sockets (and by extension, cables) that we're all used to.

This is a kind of good thing (see conclusion). However, the downside is that you'll always have to keep a close eye on your power cable at LANs, because if you grab any normal cable by mistake (or somebody else grabs yours), you won't be able to plug your computer in at home.

This will result in frantic phone calls, amusement for your mates and anger for you. You won't be able to just pull a power cable out of your box of assorted bits for your computer anymore.

It's not modular either, which you'll wish it was the moment you start attempting to do some cable management. There's a squid's worth of power tentacles (get your mind out of the gutter) attached to this thing that are about as easy to manage as they are to detach. Which they don't.

Despite its annoying usability flaws, it's a solid contraption, and passed our testing in style.



Corsair HX-1000W

The power supply to have for any serious enthusiast

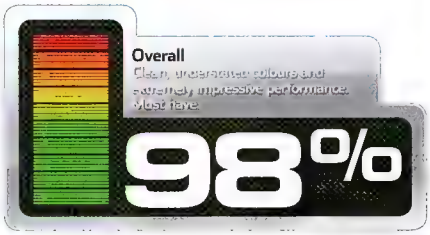
Price $359
Supplier Corsair
Website www.corsair.com.au

Success! And success without any UV reactive, clear perspexed bling whatsoever! Hooray! When you compare its $300-odd dollar price tag to the more expensive 1500 watt failures in this test, there's even more reason to celebrate.

The interesting thing about the Corsair is that it divides its 12 volt output amongst just two high current rails, instead of the six lower current rails that other power supplies opt for. It's got six modular outputs for peripherals and although most end in four connectors, some provide only two connectors. If you're grouping a small number of drives together, this will minimise the excess length of your runs.

Corsair's 750W PSU did very well in the last roundup and was the only one to use a single rail for its twelve volt output. Between its last effort and this triumph, Corsair has our tick of approval.

It's nice to see an honest entry that does its job the way it should without any fuss.



Enermax Galaxy 850

A little stability goes a long way

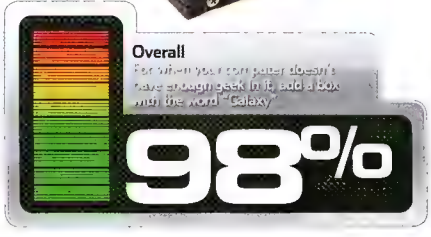
Price $259
Supplier Enermax
Website www.enermax.com

We have another success story, but this time with a twist.

Enermax makes an essentially identical 1000W version of the Galaxy. Both it and this 850W little brother passed Big Willy. Both weigh the same and both are capable of outputting a hypothetical 24 amps on each of their five 12V rails. But according to the stickers, under stress, the rails on the 850 will only deliver a combined total of 34 amps compared to the 1KW version's 41. But we couldn't measure this difference.

Of all the power supplies we tested, the Galaxy's output voltages were the closest to ideal in every condition. It only dipped below 12 volts for half a second during the entire test, and that was during startup. Under load the average fell from 12.125-odd volts to 12.1-odd volts – results so insignificant they're only worth mentioning to point out how stable it is.

The supply is mostly modular: you get a lead of SATA power connectors and some PCI-e power in addition to the standard system cables you'd expect. Kudos to Enermax for making a solid and well featured PSU.



InWin 1500W Commander

An ammo box without firepower

Price $459
Supplier InWin
Website www.in-win.com.tw

We were going to spend this whole review mocking this PSU, but we were pulled up by the Editor because it would have been all humour and no substance.

Despite its 1500W label, militaristic styling and generic OEM rebranding, it could only spin up 21 drives from a standing start. It didn't do this very well: our Adaptec card reported that two drives were missing from the array. We charitably drew the performance line at 20 drives, after a day's worth of sustained stress testing and much deliberation.

It's got an arseload of 12V PCI-e plugs, two of which are part of the loom and can't be removed. The muted green chassis' side is festooned with the same promotional type that is printed all over the cardboard box it ships in (namely '14cm fan', 'Support SLI', 'Efficiency', 'Modularised' and other such bollocks, all of which is on the side that's visible through your case window) in a yellow font that makes it look like some sort of faux ammo box that might be handed out at a careers night.

There's really nothing special about this, except it somehow manages to be an inanimate object with an ego.

Seasonic X900

Fails to 'rouse our Willy

Price $269
Supplier PowerhousePC
Website www.powerhousepc.com.au

Not only did Big Willy take noticeably longer to boot, the RAID card lost drives when anything more than one GPU and 16 drives were in use. We decided that this was unacceptable, and the results we've printed are from this configuration, even though it would *technically* boot if we connected more drives.

Although you can't see it from the averages, the twelve volt rail dipped worryingly low during startup. It was down to 11.194 volts at one point – even though the 5 and 3.3 lines were quite stable. Under load, there were a few instances where it dropped to 11.45 volts for one to two seconds.

It's not modular either; you're going to have a hard time managing the cables. And although it's got four six-pin PCI-e power cables, it doesn't have any eight pin ones, so if you have a graphics card that requires eight-pin power, you'll have to resort to using whichever PCI-e eight-pin adapters happen to come with your graphics card.

Huntkey 80 Master 700W

The most blinged-out box in the hood

Price $169
Supplier Powerhouse PC
Website www.powerhousepc.com.au

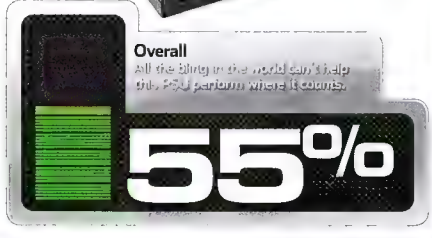
Huntkey is a relative newcomer to the high end PSU game. It's been doing power supplies for corporate boxes for some time, and its OEM designs are rebadged by the like of Antec and others as middle and lower end PSUs.

This is the highest wattage PSU Huntkey makes, but it's the lowest wattage PSU in this head to head. At a sticker rating of 150 watts less than the next competitor, it's a little unfair to lump it in with the other supplies on show here. But the 850W Enermax managed, so we're going to see what it can do.

It could only power a single GPU and nine hard drives. It could support 15 drives if you staggered the startup times, but that's not something you want to do every time you turn on your computer, so our results were taken with nine drives in action.

It tries admirably, but like US Vice-Presidential Candidate and Alaskan Governor Sarah Palin, it doesn't deliver (Zing!).

It may well be the shiniest, most chrome laden of the bunch, but it isn't modular and has only a single 8cm fan, which makes it more like a yum cha PSU on steroids. Or crack. Or 20 inch spinning rims. Your choice.



Xigmatek No Rules Power 1500W

The lone gunman of PSUs...for all the wrong reasons

Price $399
Supplier Multimedia Technology
Website www.mmt.com.au

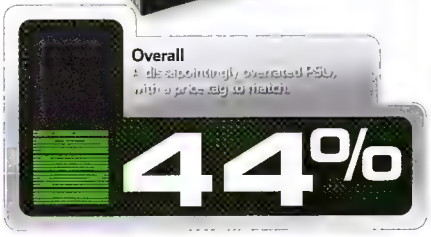
You'll be able to spot this power supply in computer stores if you just look for a gargantuan box. Although the name seems to imply massive, beefy, rebellious-physics-outlaw levels of wattage, you'd be forgiven for feeling gyped if you managed to take it to its full potential.

It's a generic 1500 watt box that's also been rebadged by Inwin and Thermaltake. It can't power all of Big Willy; just 19 drives. But it does come with arguably more PCI-e power cables than you need. Which is worrying when you look at the low readings on the twelve volt rails throughout the tests.

Thankfully the side effects of too little voltage aren't as severe as too much voltage – but this wasn't an issue with any of the supplies we tested.

After we ran through our battery of tests and shut down to prepare to take startup readings, we found that the thing didn't even start reliably, giving us an annoyingly incomplete results spreadsheet.

It may lumber around being all loud and acting like it's king of the hill, but that's only because it's got problems going the distance.



Amacrox AX1000-EP

1000 watt name, 1000 watt price... not 1000 watt performance.

Price $320
Supplier Anyware
Website www.anyware.com.au

Going into the test, its lightness was a foreboding sign of possible failure to come. And sure enough, we found that it would only support a maximum of seventeen drives.

We fired up our logging multimeters, connected everything, shorted some mobo jumpers and watched it spring into life.

We then watched it unceremoniously collapse, then spring back into life again. It kept on trucking after this single hiccup, and after stress testing and restarts without any adverse consequences to this minor flaw, we got some consistent results.

While its output was consistent – except for a noticeable dip to 11.56 volts during startup over the course of six seconds – for something that claims to be a kilowatt PSU, it sure didn't live up to its reputation. The Corsair and Enermax both support Big Willy, yet this 1000W PSU doesn't.

If you're looking for components that will work with that all-chrome PC you're planning, then maybe it's worth it. Maybe.

Thermaltake Tough Power 1200

A PSU that conquers Big Willy... just.

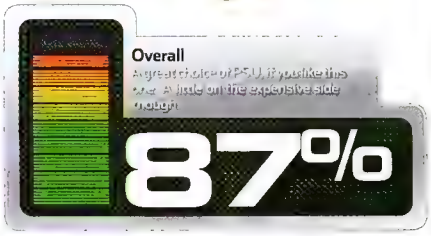
Price $379
Supplier Anyware
Website www.anyware.com.au

Although this PSU is basically a 1200 watt version of the stunningly overpriced OEM failures that are the 1500W PSUs, it somehow managed to run Big Willy when the others didn't. Apart from the sticker wattage, the only other notable difference is that there are no PCI-e six- and eight-pin leads hardwired into the unit and the paint job is different.

It didn't power Big Willy cleanly, though. It delivered a consistent 3.27, 4.75 and 11.57 volts, except during the first five-odd seconds of startup, where the 12 volt rail dipped worryingly close to 11.1 volts. Regardless, it managed. We've got several theories...

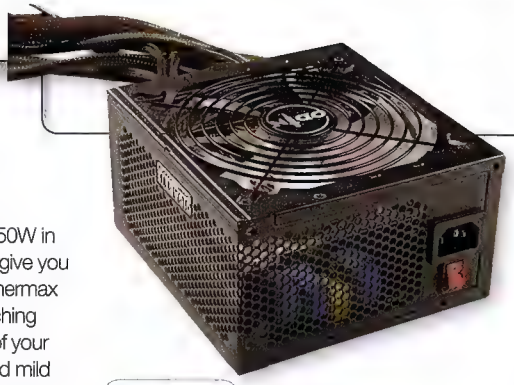
Perhaps the OEM design is made for 1200W operation and the efficiency at 1500W operation takes a dive. Perhaps it was built with better components, either deliberately or by luck of the draw. Perhaps there were environmental conditions working in its favour when we tested it. Perhaps one of the people on the assembly line built it with more love.

Whatever the reasons, it can technically power Big Willy, in the same way Minardi Cosworth used to technically compete in F1.



Gigabyte Odin 850

Norse mythology, or competent powerhouse?



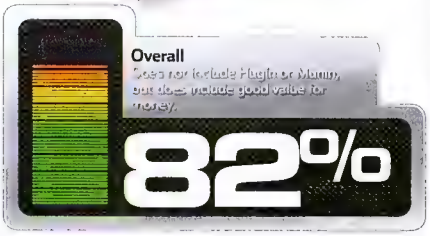
Price $235
Supplier Altech
Website www.altech.com.au

It may not be the best option in this head to head, but we're quite happy with how the 850W Odin performed.

It merrily powered 18 drives with no stability problems, which means it beats both the Antec and Amacrox 1000W power supplies. Even more amusingly, it's nipping at the heels of the 1500W models, showing a combination of those expensive and underwhelming things flat out sucking and the Gigabyte PSU punching well above its own weight.

Sure, it gets beaten by the Enermax 850W in terms of raw performance and it doesn't give you the kind of bang for your buck that the Enermax does either. But if you're mixing and matching components in an effort to trim the cost of your system and you have a distant, vague and mild concern in your mind when you look at what power supply to get – like that feeling you get when you think about superannuation – you should be safe in the knowledge that this baby will perform adequately and will expand as your PC does.

When you weigh the price and output, we'd place this in third or even second place, depending on how much you're prepared to spend.



Tagan 1300

Blinky lights and plastic sheathing... oh my.

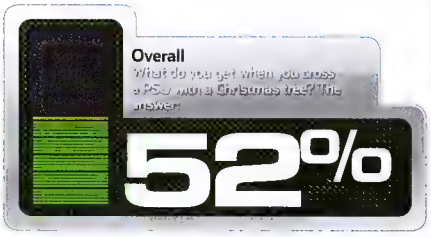
Price $369
Supplier Protac
Website www.protac.com.au

1300 watts? Bah! Big Willy thinks otherwise.

In its defence, all the rails on the Tagan were consistent throughout our tests; however the five volt line averaged a forgettably low 4.8-ish volts throughout. This would not be worth mentioning if the 12 and 3.3 volt lines were 0.1 volts higher than what physics experiment land readings should have been.

The Tagan features the most irritating modular system in the roundup. Instead of using connectors that lock once you push them in, you've got to screw the connector in with a threaded washer-thing after you plug them in. As an added bonus, this completes a circuit that illuminates a ring around the socket of the PSU – red and green for PCI-e connectors, blue for peripherals.

The PCI-e cables are not only braided, they're coated in plastic, presumably so you can identify them by touch instead of sight or some equally dubious reason. There are also six and eight pin PCI-e plugs attached directly to the unit.



Antec TruePower QUATTRO 1000

VROOOM!

Price $269
Supplier Altech
Website www.altech.com.au

It's got racing stripes! And a single 8cm fan! And some cables! And very little else!

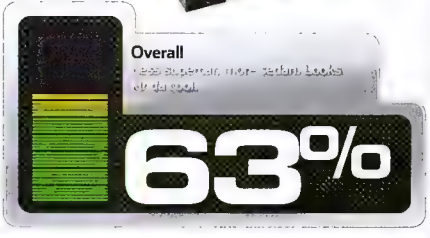
It took about five seconds for the 12 volt line to stabilise, but after that it was perfectly reliable. More interestingly, over the same period the five volt line sagged from 4.87 to a constant 4.69 – the lowest five volt average of any power supply.

The more useful result is the number of drives it managed to spin up. That number is 17, which makes the Antec quite mediocre. Amongst its single kilowatt peers, it's on par with the Amacrox, and is beaten by the Corsair.

There are two eight pin PCI-e power cables hardwired into the PSU that can be used as six pin connectors. You get another two modular six pin connectors, so it'll run every video card combination except triple SLI without needing molex adapters.

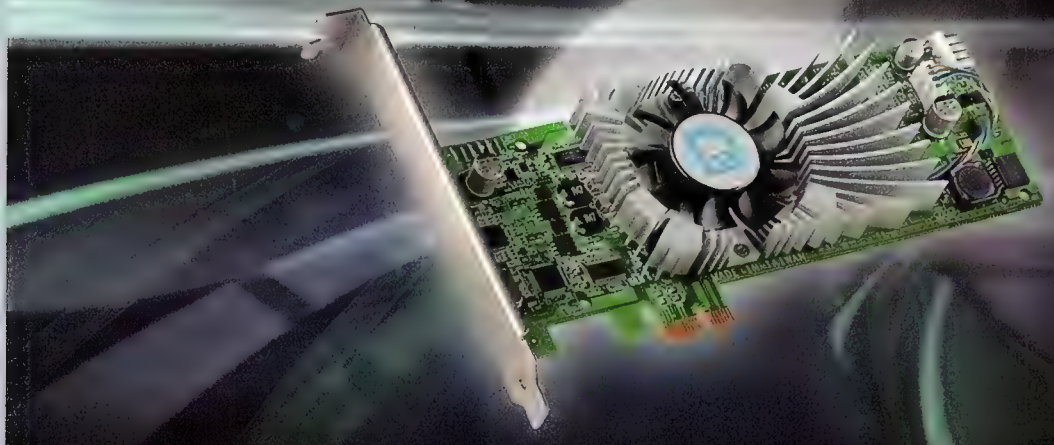
There's nothing particularly special about it. We will say we're thankful that Antec's art director doesn't appear to have made any sort of dodgy design statement intended to reflect what he or she thinks about what is inside of every geek.

Unlike some others we could mention. In Win. Oops, forgot to obscure that one by coughing.



LEADTEK

Leadtek The Best TV Solution Provider



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DTV-Dongle GOLD

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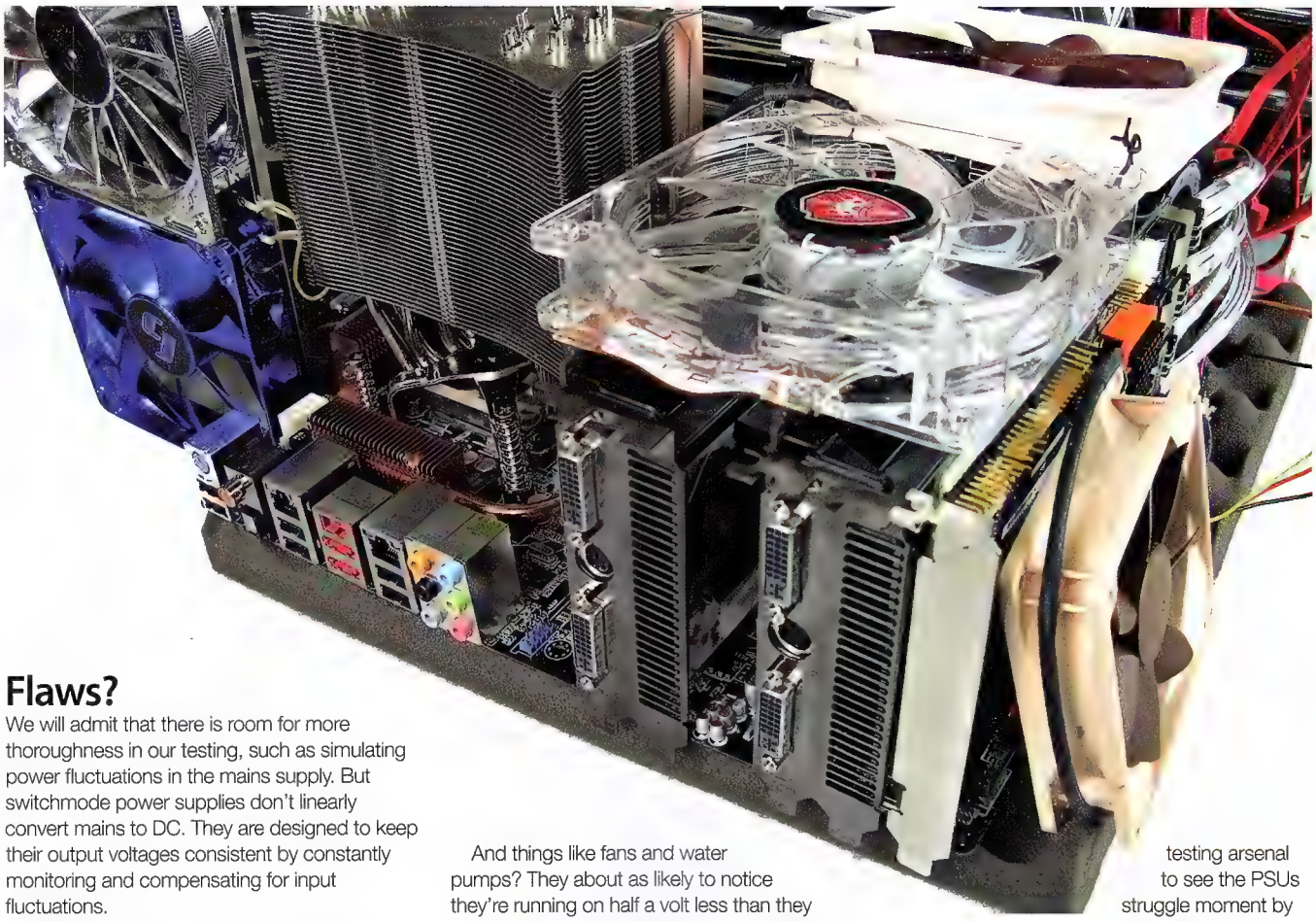

Flaws?

We will admit that there is room for more thoroughness in our testing, such as simulating power fluctuations in the mains supply. But switchmode power supplies don't linearly convert mains to DC. They are designed to keep their output voltages consistent by constantly monitoring and compensating for input fluctuations.

This is even less of a problem in the real world than you'd think. The variances in a PSU's rails are a consequence of its ability (or lack thereof) to deal with high loads in some rails and not others. Not only that, but computer components are built to tolerate power fluctuations, which is what manufacturers are really saying when you read motherboard boxes that carry on about things like however-many phase CPU power modules.

And things like fans and water pumps? They about as likely to notice they're running on half a volt less than they should be as the Chinese are to notice one less Olympic bronze medal.

If we had vastly more expensive gear, such as some form of logging oscilloscope, we could have examined the transient response of the rails more closely during startup. Our meters cap the resolution of our results at 2Hz (a reading every half second) but it would have been cool to have had a several megahertz oscilloscope in our testing arsenal to see the PSUs struggle moment by moment.

We wanted to test efficiency, but for that we would have needed to know the power draw at the wall and the power output of all the DC stages. And to do that we would have needed some kind of multiple-rail, hall-effect-logging DC wattmeter to know exactly what the PSU was outputting.

Which we don't have. Damn.

Thermaltake Express Power 450

A quick-fix solution that actually works?

Price $89
Supplier Anyware
Website www.anyware.com.au

During our testing, if a PSU waved the White Flag, we didn't let it off the hook. Instead, we went all World Bank and helped it with some extra watts until it got through the tests.

This is what we used to do it.

The Thermaltake Express power 450 is a dedicated graphics card power supply that works in tandem with your normal PSU. It connects via a passthrough 24-pin system power cable that takes a split of the green /PS_ON wire, so both it and your normal PSU turn on when you push the power button on your case.

This is an excellent thing, and not just because it lets you put something other than a single DVD-burner in your case's multiple 5.25in bays. If you've just thrown a second graphics card into your PC and your old PSU can't cope, it's an elegant way to solve the problem.

It uses a non-standard power lead that threads through an included backplane and grommet out the back of your PC, so if you're going to get one and plan on moving your PC to LANs often, remember you'll end up with a second lead running into your computer which is pretty firmly fixed.

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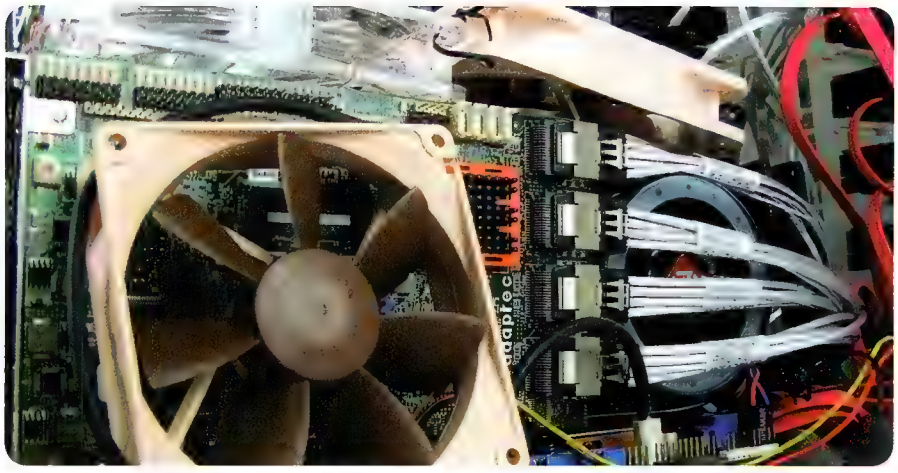


That damned lead...

As you read earlier, the Cooler Master Ultimate 1100 ships with an annoying non-standard power lead that is rated for 16 amps instead of the common 10A IEC lead (fine then: computer lead or jug plug) that we're all familiar with.

This annoyed us greatly, because if you lose it you'll have an uphill battle ahead of you to find a replacement. We fumed at this deviation from standards for a while; then realised that they might actually have a point.

Cooler Master's reasoning for deviating from established power connector standards is due to safety considerations, specifically "to make sure that current rating is strong enough to support such high wattage". And while that isn't an issue in Australia, it may be one in America.

Let's check their working.

Most of the power supplies we've looked at (bar the 1500W models) will work anywhere in the world, from 110 to 250 volts. All of them have active power factor correction, so they all react (mostly) like a normal resistive load, meaning the old faithful Power = Amps times Volts (P=IV) calculation works.

The power you draw through the AC lead is the DC load multiplied by the efficiency and the power factor.

Sadly, we couldn't test efficiency of the power supplies due to the shortcomings of our testing methodology. So in our calculations, we're going to give them the benefit of the doubt and assume they are 80 per cent efficient, seeing as though '80 Plus Efficiency' certification is the latest craze in PSU marketing.

In the case of Cooler Master's Ultimate 1100, the power through the AC lead would be:

AC = 1100 * 80% * 0.95%

AC = 1447 Watts through the cable.

This is fine through an Australian 10 amp IEC lead, which can deliver (250 * 10 =) 2,500 watts. But after a quick chat to a US-based friend about to find out what American IEC leads are rated at, it became obvious that the Cooler Master's current draw is very close to the theoretical limit of a standard 13 amp American IEC lead, which in physics theory land can deliver (110 * 13=) 1,430 watts.

It's a murky area, and one that we could answer if we could test efficiency and had American PSU samples and a 110V AC supply at our disposal.

It means we can't say for sure if Cooler Master has had the engineering foresight to allow headroom for safety standards on an international design, or if it has deliberately changed the power socket on the Ultimate 1100 as a marketing gimmick to make it look more impressive than it really is and annoy its customers in the process. It's worth noting, however, that it was one of the few PSUs here that passed our tests with flying colours.

The most annoying thing about all this, however, is that it means we can't say with any certainty if Thermaltake's 1200W and Tagan's 1300W models are safe to use in the US. So we will say that if you're heading to the US anytime soon and planning on taking your Thermaltake 1200 or Enermax 1300 powered PC with you, buy a chunky US IEC lead when you're over there.

Most of the numbers that you see on the boxes of power supplies are predominantly marketing gimmicks...

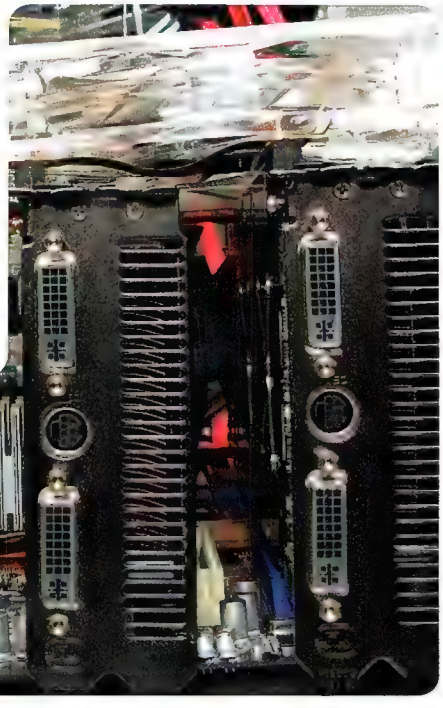
What have we learned?

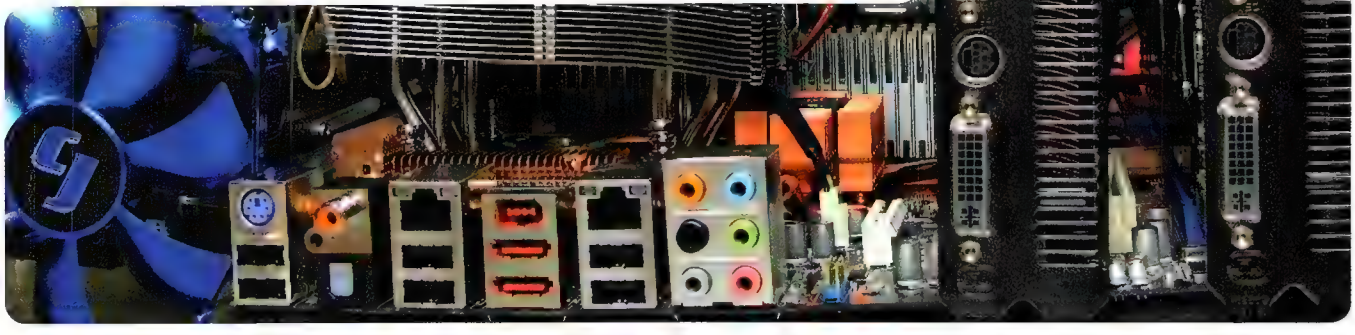
If you're seriously thinking about buying a kilowatt or greater power supply, it's likely you're doing it simply so you can say you've got one. You can't even put the components that make up Big Willy in any computer case.

Most of the massive numbers that you see on the boxes of power supplies are predominantly marketing gimmicks, with the exception of a few that we've uncovered in our testing.

You'll notice that no two power supplies in this head to head are from the same company. Feel free to use this as a guide until we put as many power supplies as we can get our hands on through their paces, and remember to hit our site regularly to check for updates.

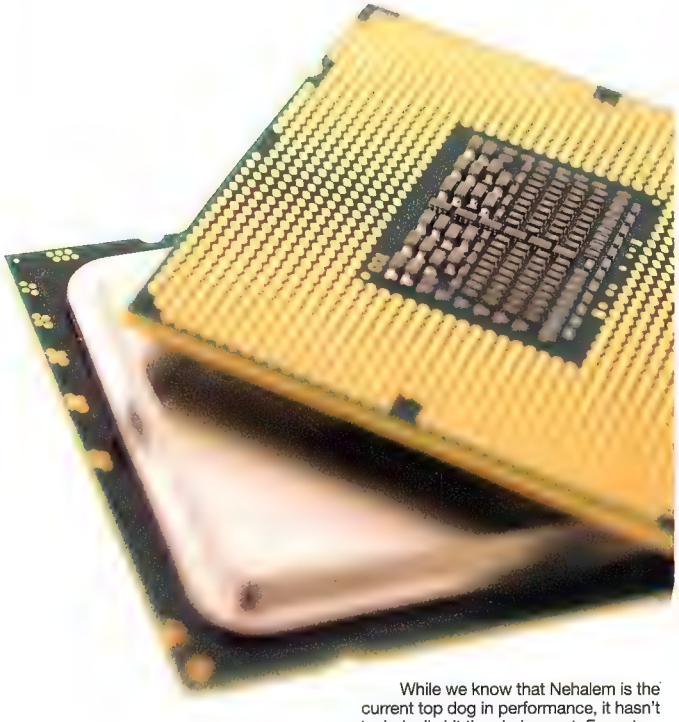
We have seen certain power supplies here that claimed to output epic amounts of power, but couldn't. And seeing exactly where those walls are, and how hard various PSUs hit them, is a good thing to know.





KITLOG

There's nothing sexier than new kit. And whether you need to horde your pennies (Budget), want the most power for your dollar (Performance) or own a small mansion and a collection of sports cars (Extreme), we're here to help with this handy matrix of Atomic recommended products. You may find your needs fall between categories – that's okay, just mix and match to suit your budget! Each piece of kit has been reviewed hands-on in Atomic, so if you want to learn more, look up the issue and page number listed.



While we know that Nehalem is the current top dog in performance, it hasn't technically hit the shelves yet. Expect an update when it is!

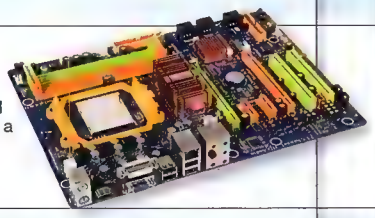
BUDGET

CPU

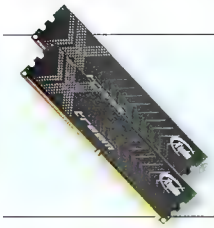
AMD Phenom X4 9550
PRICE $170-180
A well performing Quad core for those on a budget, that won't break the bank and doesn't get too hot.

MOTHERBOARD

BIOSTAR TA790GX A2+
PRICE $150
A great overclocker with fast integrated graphics - you don't even need to buy a graphics card with this one!
Reviewed in Issue 93 – Page 34



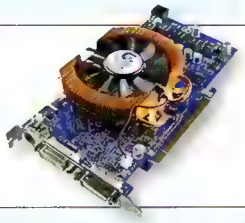
MEMORY



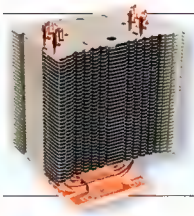
TEAM Xtreem Dark PC2-6400 C4
PRICE $60
These modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.
Reviewed in Issue 80 – Page 56

VIDEO CARD

GeForce 9800GT 512mb
PRICE $150-160
A 55nm card that remains very cool and fast, with plenty of headroom for overclocking and a price that speaks volumes about it's value. Great performance too.
Reviewed in Issue 92 – Page 49



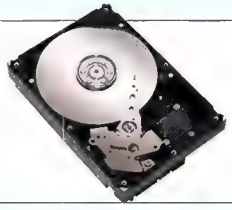
COOLER



Noctua NH-U9B
PRICE $72
Labs tested to be the top of the cooling game without breaking the bank (or making you sweat – haha)
Reviewed in Issue 89 – Page 36

SYSTEMDRIVE

640GB HDD
PRICE $90
The absolute best value for money, with two 320GB platters giving great speed and low latency.



DISPLAY

AOC 2216Vw
PRICE $240
A great 22" widescreen for any purpose, with accurate colour reproduction and a bloody good price.
Reviewed in Issue 94 – Page ??

SPEAKERS

Steelsound 5Hv2
PRICE $120
Great gaming headphones with inbuilt mic, but music quality falls short.
Reviewed in Issue 73 – Page 43

CASE

Cooler Master CM690
PRICE $100
A sturdy, spacious case with plenty of airflow and more than enough room for the biggest of systems. Some stores even have a windowed version!
Reviewed in Issue 84 – Page 51

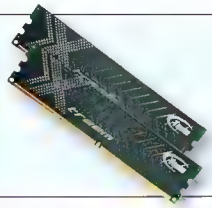
PERFORMANCE

Intel Core 2 Duo E8400
PRICE $190

A processing powerhouse, now affordable and overclockable like buggery. The Q6600 is the best buy, at about $240.

GIGABYTE EP45-DS4P
PRICE $195

A P45-based mobo with a bevy of features and a good overclocking potential.
Reviewed in Issue 93 – Page 55

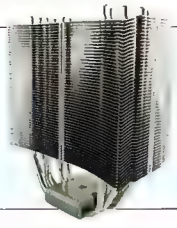


TEAM Xtreem Dark PC2-6400 C4
PRICE $60

Cheap, overclockable and good lookin' to boot. The modules fill the void that was previously left between cheap value RAM and enthusiast overclocking kits.
Reviewed in Issue 80 – Page 56

Sapphire HD4870
PRICE $319

One of the best price to performance cards on the market. Welcome back Red!
Reviewed in Issue 92 – Page 36

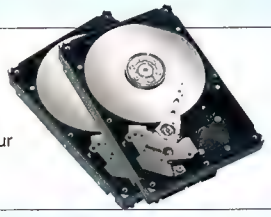


Thermalright Ultra 120 Extreme
PRICE $65

Tower cooling that will keep your tower cool. Whack a Nexus 120mm fan on for near silent cooling.
Reviewed in Issue 89 – Page 33

640GB HDD - Times two!
PRICE $90x2

All the speed of dense platters, with the peace of mind to be able to back up your precious files.

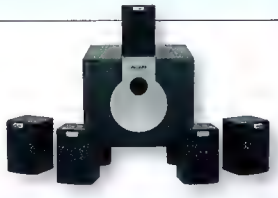


LG W2252TQ
PRICE $270

You'll pay a little more for this 22" screen, but the colours are amazing, with no backlight bleed and no ghosting.
Reviewed in Issue 94

AVLabs AVL325
PRICE $210

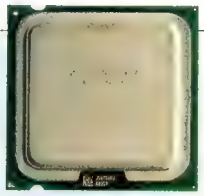
Slightly aged speakers now, but these still offer a great 5.1 sound experience - if you can find a set.
Reviewed in Issue 64 – Page 50



Cooler Master HAF 932
PRICE $180

A massive case with three 230mm fans that can move enough air to qualify as a small aeroplane. And quiet to boot.
Reviewed in Issue 93 – Page 48

EXTREME

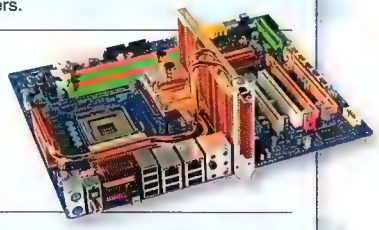


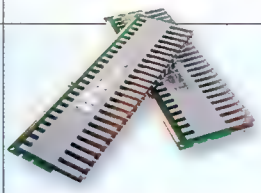
Intel Core 2 Extreme Q9550
PRICE $410

A 45nm Quad that can be pushed almost as far as the dualcore counterparts, while staying cool and fast. Great for multitaskers.

GIGABYTE EP45T-Extreme
PRICE $359

A board that not only dabbles in excess, but redefines the word. More copper than silicon here as well.
Reviewed in Issue 93 – Page 57



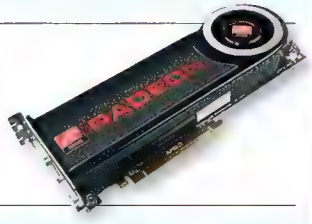


Patriot Viper DDR3-1800 C8
PRICE $325

Very cheap DDR3 with amazing performance, and a great OC'ing capability too. You can't go wrong with these modules.
Reviewed in Issue 93 – Page 52

ATI 4870X2 2GB
PRICE $650

All the performance of two cards, with the size of one. Makes an ungodly amount of heat, but matches this with unbelievable performance.
Reviewed in issue 93 - page 32

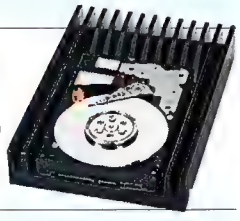


Coolermaster Aquagate Max
PRICE $239

The best of all boxed watercooling solutions, this kit is a great step up over air cooling. We like how green it is.
Reviewed in Issue 90 – Page 36

WD 3000GLFS VelociRaptor
PRICE $349x2

The fastest desktop HDD we've seen yet. Grab two and RAID 'em, or mix 'n match with a 640GB for storage capacity and speed.
Reviewed in Issue 90 – Page 52



Dell 3008 WFP
PRICE $2199

It's enough to make a grown man weep and beg. Or, at least, that's what we'd do for one of these simply gorgeous displays.
Reviewed in Issue 88 – Page 59

Logitech Z-5500D
PRICE $319

Able to play the 'liquid gold' that is DTS 96KHz/24-bit, this 5.1 beast can wreck both home and hearing alike.
Reviewed in Issue 48 – Page 56

Lian Li X-2000
PRICE $575

The only case we've had in that has made the editor orgasmically happy, and is drenched with quality in every one of it's brushed aluminium panels. Definitely a case to show off your system-building prowess!
Reviewed in Issue 91 – Page 54

I think I'm turning cyborg-ese...

... he thinks he's turning cyborg-ese, he really thinks so.

Let me tell you how you can live forever. Or, at least, for a very long time.

If it is possible for the activities of a human brain to be emulated by some other computing device, then it is possible for a human mind to be copied to a computer – 'uploaded', in current science-fiction parlance. The computer can then run the human-mind program indefinitely. If it runs the human-program much faster than a normal brain, then from the point of view of the emulated brain, thousands of years could go by per real-world minute.

Which could be very good, if you've got lots of interesting things to do in there. Or very bad, if your immortal computerised consciousness is just clawing at the inside of a featureless white digital coffin for a trillion years.

There's no evidence to suggest that a computer actually can simulate any brain more complex than an insect's, but there's also no reason to believe that the human brain is anything other than a fiendishly complex analogue computer. It's already easy to simulate simple analogue computers with current digital hardware. You can run a neural-network simulation with more complexity than a worm brain on a Commodore 64.

So let's assume, for the sake of argument, that it will, one day, be possible for computers to emulate a human brain. And, importantly, that we'll come up with some way to scan a brain and upload it. Hey presto – something close to immortality for that brain, right?

Well, yes. But also no.

For all you know, a cloaked alien saucer just flew over you, scanned your brain and immediately set it running in a wonderfully stimulating environment in the saucer's on-board computer.

That doesn't help the version of you that's still sitting here reading this magazine. You, here, will still die when you die. I, for one, don't much care how many copies of me might exist. I'm concerned about the version of me that's sitting here typing these words.

The problem, it seems to me, is discontinuity. All of us are very different creatures from the ones we were when we were five years old, but we're not concerned about the 'death' of the young version of ourselves. That version just slowly and continuously turned into the current version.

Heck, if a serious change in brain-state counts as a death, then you die every time you go to sleep. Most people don't worry too much about that, though.

Here's what I, and numerous people much cleverer than me, have come up with as an alternative to the copying problem.

Presume that there is a computer augmentation that you can attach to your skull, like Lobot from The Empire Strikes Back. When you first attach it, it grows nanotech tendrils into your brain, and uses them to read your neural activity and build up its own neural net. Its net slowly comes to mirror your own.

In the next stage, when your brain cells die or when the computer can help you with something, it starts to write to your brain when appropriate. At first it only replaces the occasional lost pathway or pops a little information into your consciousness that your own brain couldn't generate, but it does more and more as time goes by.

Eventually, the organic brain can have died off completely.

But there's been no distinct point when 'you' moved from the meat to the computer, any more than there was a distinct point when 'you' stopped being a baby. You could take the death of your last organic brain cell to be an arbitrary point of loss-of-human-ness, but 'you' certainly didn't reside in that one last cell.

And now, hey presto, you're uploaded.

Please form an orderly queue for the procedure.

(It'll help everyone out if you shave your own head while you're waiting.)

I, for one, don't care how many copies of me might exist. I'm concerned about the version of me that's sitting here typing these words.

I for one welcome our new cyborg overlords. Do you?

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Nehalem is Intel's latest powerhouse enthusiast and performance CPU. Built on the 45nm process, and designed around an entirely new architecture, our testing shows that extreme versions of this new chip can nearly double performance in CPU intensive benchmarks, and significantly boost games performance.

See the page opposite to find out how you can win one!

To find out more, visit:
www.intel.com.au

WIN NEHALEM!

In this issue of Atomic we unleash Nehalem, and as an added bonus for Atomic readers, we're giving one away! Being made available to the public early November, you can be one of the first to own Intel's awesome new CPU!

To win it, you'll need to subscribe to Atomic via our website and tell us the last time a piece of tech excited you (or us!) this much.

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TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

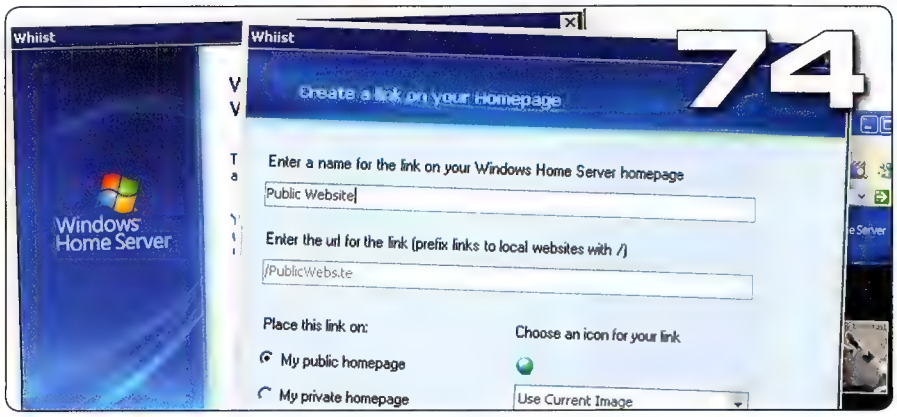
Other sections have gotten fat on pre-Xmas turkey and bloated on holiday booze, so tutorials this month are a little thin on the ground – but though small, we think you'll find it's perfectly formed.

We catch up with some more Windows Home Server action, this time teaching you all about extending the platform's functionality. It's a two part article that we're sure all home entertainment enthusiasts will love.

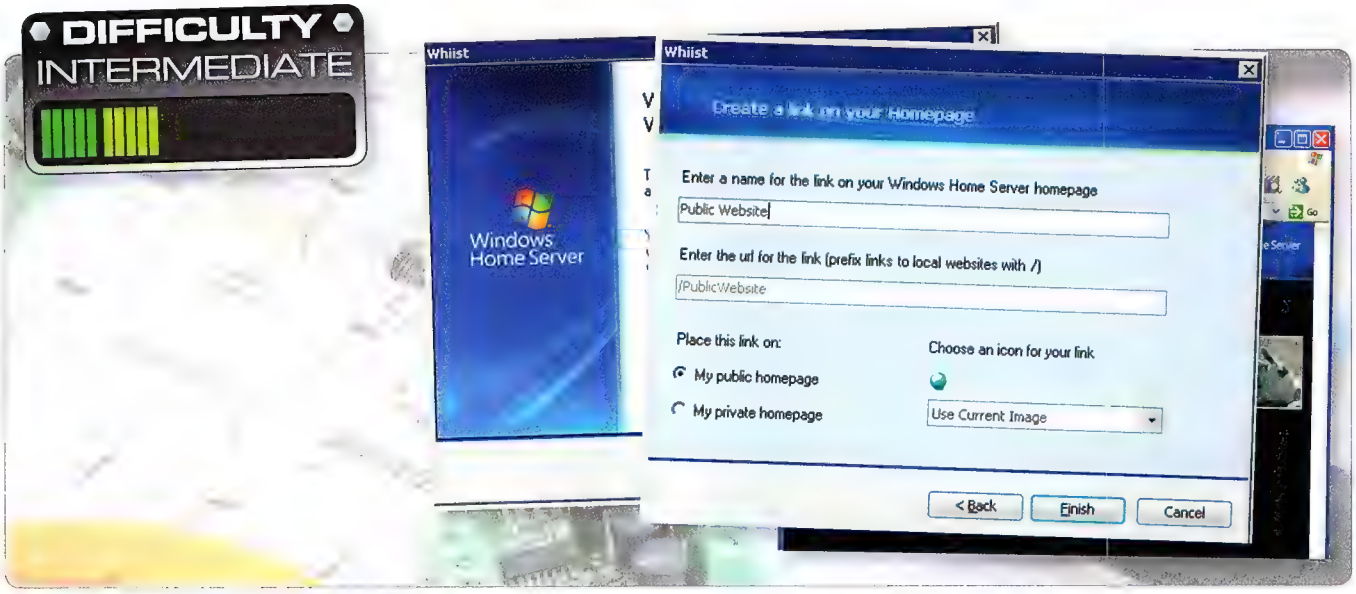
Chris Taylor (whom my fingers always insist is called Christ) then follows up with more wise words on matters educational in Atomic.edu. Finally, there's more life lessons to be learnt from Zara Baxter, wherein she considers a few things she noted at the recent Atomic LIVE.

Next month, we'll be back into full swing with more awesome tutorials for every flavour of techie!

HARDCORE CONTENTS



DIFFICULTY INTERMEDIATE



Extending Windows Home Server

More ways to get your home served with all kinds of tasty data.

In this article we'll be looking at some of the ways you can expand the functionality of Windows Home Server. Out of the box, Windows Home Server has some pretty nifty features, and you can easily add more by using the built in add-in system, or by installing them onto Windows Home Server itself. At the end of the article, we'll show you how to install Whiist and SharePoint 3.

Extending Windows Home Server can be as simple as copying the add-in installer to the add-ins folder on the server and installing it using the Windows Home Server Console. It's also possible to install programs directly onto the underlying Windows Home Server operating system, which is basically Windows Server 2003. This is achieved by logging in directly to the system, or logging in via remote desktop and installing applications directly on the server.

More extensions can be added by setting up Windows services, tinkering with IIS or adding your own web server (such as Apache).

Finally, Microsoft has made available a Software Development Kit so you can make your own add-ins, if you're that way inclined.

Not only are there some commercial add-ins already available, but the Windows Home Server community has created dozens of add-ins for all sorts of purposes.

A life less add-in-ary

Server Management add-ins help to manage your server; important things like temperatures, hard drive status, anti-virus and disk defragmenting.

Some add-ins help you with off-site storage. While storing files on your server is a great way to safekeep them, you can never guarantee that your server will always be available due to conditions out of your control, such as fire or theft. Storing files off-site is a way to overcome this; you can do this physically, by backing up your server to external hard drives and taking them off-site, or by uploading them to dedicated websites.

Windows Home Server is evolving into the media serving device of the future. While it's not quite there yet, you can install add-ins to help you view and stream all your media anywhere in the world.

... you can never guarantee that your server will always be available due to conditions out of your control, such as fire or theft.

Out of the box, it can only stream video, pictures and music to media extender devices on the local network, but by installing add-ins such as Web-Guide for WHS FREE or LobsterTunes, you can access these media files across the internet, even on compatible Windows smartphones.

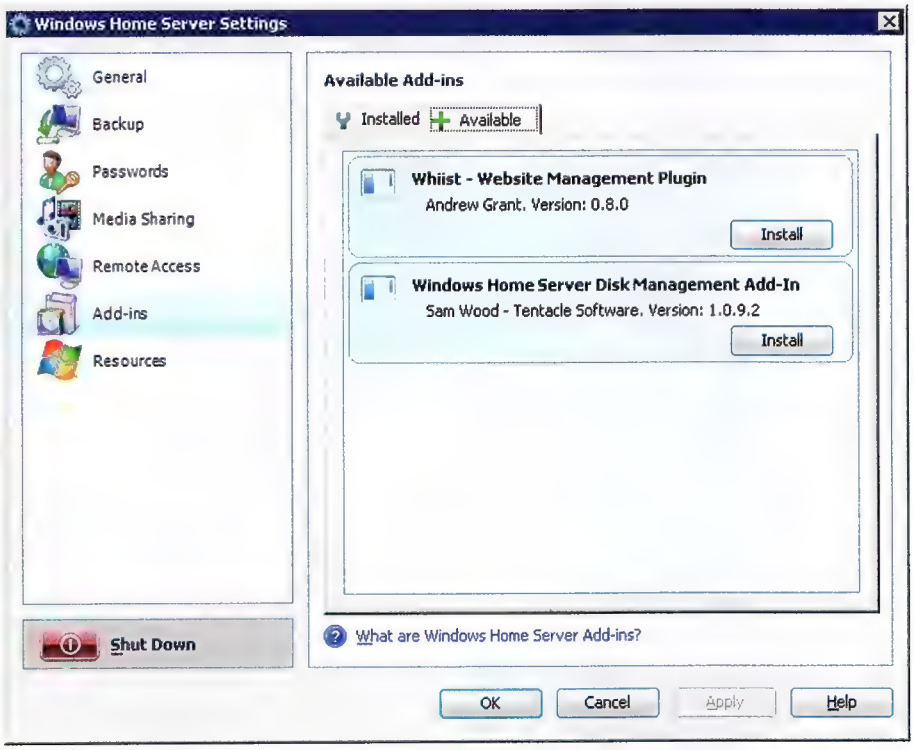
Then you have remote access add-ins, that let you personalise or add extra features to your Window Home Server Remote Access Website.

Some common server management add-ins:

- **WHS Disk Management** – WHS Disk Management gives you a lot more information about your installed hard drives, including drive temperatures, disk labels, and a wireframe of your drive placements in (or out of) the case.
- **Avast! Anti-Virus WHS Edition** – An antivirus solution for your Windows Home Server with 10 client licenses for your home computers.
- **Diskeeper 2008 HomeServer** – Diskeeper 2008 HomeServer is a disk defragmentation utility designed especially for Windows Home Server. Due to the unique nature of the Windows Home Server's Drive Extender, using the built-in disk defragmenter can cause data loss.
- **WHS Event Monitor** – WHS Event Monitor provides a great way to monitor system events and emails you when problems occur.
- **WHS BDBB** – WHS BDBB is an add-in that will allow you to backup your client backup database to another drive.

Offsite Storage add-ins:

- **Jungle Disk** – Jungle Disk uses Amazon's S3 service to store files offsite in case of issues with your Home Server.
- **KeepVault** – KeepVault offers another offsite



Windows Home Server Console – Available Add-ins.

storage facility for Windows Home Server, making sure new or changed files are synced with the online storage facility.

Media Streaming add-ins:

- **WebGuide for WHS FREE** – WebGuide is a comprehensive media streaming application that streams all the Photos, Music and Video that you may store on your server. It creates Photo thumbnails, allows zoom and displays EXIF data, can browse and play your Music files, and stream your Video files at multiple resolutions.
- **LobsterTunes** – LobsterTunes is an add-in for streaming your music to your Windows smartphone.
- **Firefly Media Server** – Firefly Media Server is an open source media server for iTunes and Roku Soundbridge.
- **TwonkyMedia** – TwonkyMedia is another media server that scans all your media, extracts metadata, and streams to UPnP devices around your home.

Remote Access add-ins:

- **Whiist** – Whiist (Windows Home Server IIS Toolkit) is an add-in designed to make adding web content to your Windows Home Server Remote Access Website easy. You can add websites, photo galleries and links on the homepage. Please read below for a guide on installing and configuring Whiist.
- **Add Website** – Add Website does exactly that, adds links to website on your homepage, much in the same way as Whiist.

Network management add-ins:

- **Client Info** – Client Info collects and displays information from your client computers, it does this by monitoring WMI for data such as Service Pack level, hard drive free space and temperatures, hardware device information.
- **DHCP For WHS** – DHCP For WHS is a simple DHCP server for Windows Home Server, that lets you setup DHCP on your network if your router doesn't already do this.
- **EasyRADIUS** – EasyRADIUS is a RADIUS server for authenticated wireless connections. Users can be added to the RADIUS group so they can connect to your wireless network.
- **Wake On LAN** – Wake On LAN is an add-in that will allow you to remotely wake up and shut down computers on your network, provided they are set up correctly.

Other add-ins:

- **VPOP3 Email Server** – VPOP3 Email Server turns your Windows Home Server into a POP email server.
- **WHS Outlook** – WHS Outlook is designed to add Outlook sharing capabilities to your Windows Home Server, this includes contacts, messages and calendars, very useful for busy families.
- **GridJunction** – GridJunction adds Uninterruptible Power Supply (UPS) support to Windows Home Server, including self-test facility and full notification support.
- **Power Switch** – Power Switch lets you set times for powering on and off your server.
- **ipsHomeControl** – ipsHomeControl gives you some home automation tools, such as controlling webcams and X10 devices.

Installing Whiist (Windows Home Server IIS Toolkit)

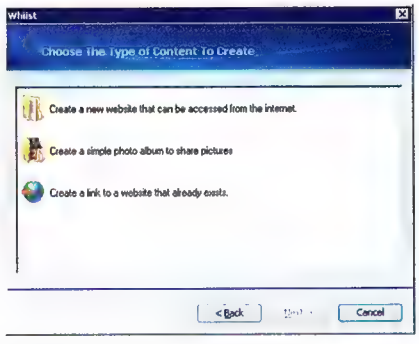
Whiist is a simple add-in that gives you a few options to personalise your remote access website, and to add extra functionality, such as a list of links, or a website, which can either be public or private.

Installing Whiist is pretty simple

1. Download the MSI installer from the author's website and save it in the add-ins folder of your server, (**\\SERVER\Software\Add Ins**)
2. Open the Windows Home Server Console, click on the Settings button and then the Add Ins button on the left bar. Click on the Available tab and click the Install button next to the Whiist entry.
3. The installer will run and automatically close the Console. When you open the Console again, you will see a new tab called "Manage Websites" which is where you change the settings for Whiist.
4. From here you can add websites or links to the front page. Adding a website is as simple as pointing to a folder on the server and putting your web page files in it. Security is taken care of by Windows Home Server user access controls.

Whiist also lets you change the image that appears on your remote access website. Great if you're not fond of the default image!

Whiist – adding a website.



Whiist – choosing the type of content.

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ICE Q 4

- **Efficient transfer of heat outside of computer case:** Cool air is drawn from both sides of the fan and hot air is forced out of the computer case. This ensures effective cooling when there is another card in front blocking the fan inlet such as in CrossFire setup.
(Other brands' cooler leaves the heat generated from GPU inside the case so the temperature inside the case will be increased leading to higher GPU temperature affecting the stablity of the graphic card)

- **Dual-slot cooling design:** Ensure you can conveniently connect the CrossFire cable to run a CrossFire setup. (Other brands' cooler which is greater than Dual-slot cannot run CrossFire Setup in some motherboards)
- **Silent and durable fan:** Significantly reduce noise level and extend service life.
- **Isolated heatsinks:** Memory and GPU heatsinks are completely separated, preventing any heat transfer from GPU to memory. Memory heatsink is actively cooled by air stream from main cooler.

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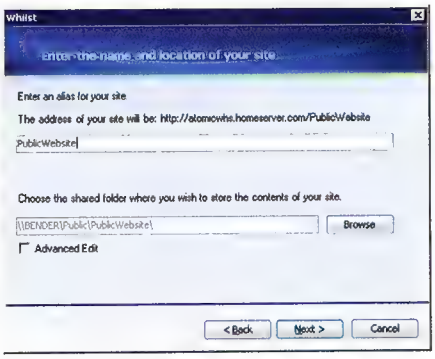
itestate.com.au	umart.com.au	pccasegear.com.au	netplus.com.au	getright.com.au	taspro.com.au

Creating a website in Whiist:

1. Open the Windows Home Server Console.
2. Click on the Manage Websites tab.
3. Click the Add button.
4. Select the option you wish to create, a link, a website or a photo gallery.

- **Create a Link:**

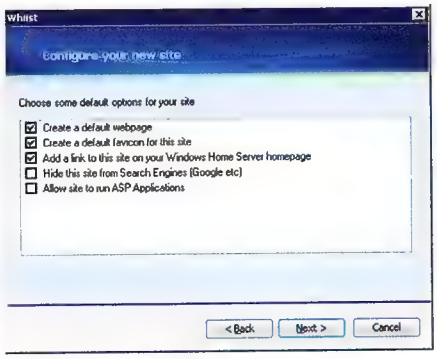
1. Creating a link is a great way to store links to your favourite sites.
2. Enter a name for your link
3. Enter the URL for your link. For sites on your Windows Home Server, simply put the end of the URL in, eg "/PublicPhotoGallery".
4. Select if you wish the link to be on your public or private homepage. The private homepage can only be viewed by entering your password.
5. Select an icon, either a default one, from a file, copied from the clipboard or the one from the site you're linking to.
6. Click Finish.



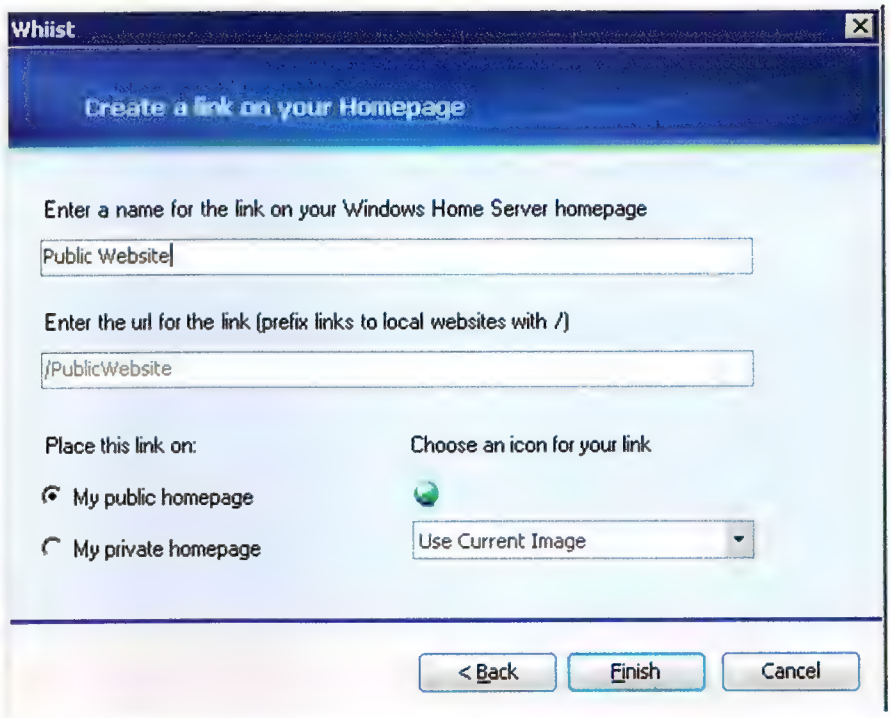
Whiist – entering the site name and location.

- **Creating a website:**

1. Enter a web site alias that will form the URL for your web site (eg. "PublicWebsite" links to **http://domain.homeserver.com/PublicWebsite/**).
2. Select a folder on your server for the web site. You may choose to create a new folder. Click Next.
3. The next screen offers you some extra configuration options for your website, the default options are fine. Click Next.
4. If you chose to create a link to your website on the homepage, you will be taken to the Create a Link wizard.
5. Once your website is configured, you will need to create and copy the content to the folder



Whiist – configuring website settings.

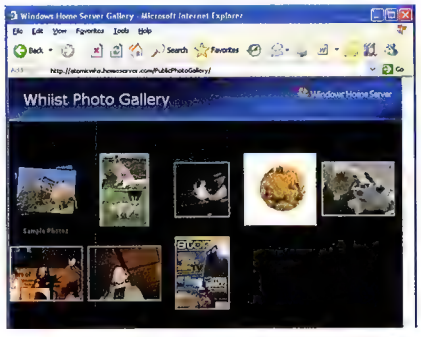


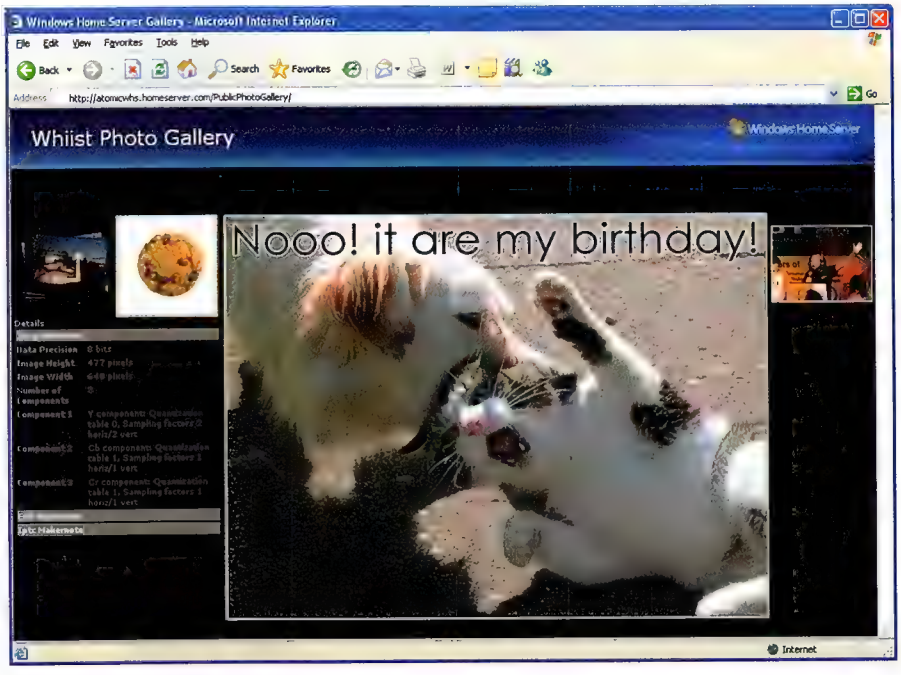
Whiist – creating a link on the homepage.

you created. You will need to create HTML files in Dreamweaver, Front Page, notepad or another HTML editor.

- **Creating a Photo Gallery:**

Creating a Photo Gallery is basically the same as creating a web site, except that Whiist puts code into the selected folder that creates a simple photo gallery website on the fly. All you need to do is copy photos or folders of photos into the folder and they will be added to the web site. SR





The Whiist photo gallery in action.

The reality of games

What it's really like to make stuff up for a living.

Since we started running the atomic.edu section, we've covered a wide variety of institutes and courses. We've looked at many different fields of employment, ranging from games development to high tech storage. This month we're again focusing on games development, although our mandate is somewhat different to usual – we're keen to address some of the misconceptions prospective employees of the industry may have. To, put simply, provide a bit of a reality check.

Studies

Last month, we looked at the offerings of two private institutes that run games development courses. As we discovered, both the Academy of Interactive Entertainment and QANTM offer a good selection of courses. With campuses of one or both institutes located in the capitals of all the eastern states bar Tasmania, attending either of these two world class institutes is more of a realistic proposition for more budding games developers than it was even a couple of years ago. The games development courses that are available and the institutes that are running them have matured significantly in recent years. Course providers work closely with local developers to ensure their material is relevant and that their graduates enter the workforce equipped with the skills necessary in a creative industry that is highly lucrative and high in pressure.

Despite the industry's involvement with shaping the curriculum of these courses, despite the increasing availability of games development courses, despite this section bearing the name 'atomic.edu', you would be mistaken to assume that a prospective employer's qualifications are all the human resources manager at a games studio pays attention to. Pieces of paper, though they may bear the mark of top notch private institutes or Group of Eight universities, aren't the be all and end all in the games industry.

Kevin McIntosh from Torus Games says, "The courses typically provide the right skills that an applicant needs for a role in the industry. If the new employee has the right foundation, they'll find it easier to learn our internal packages quickly. However, we have hired self-motivated staff that have learned [what they need to know] from books and websites – it shows dedication to their career and we love that."

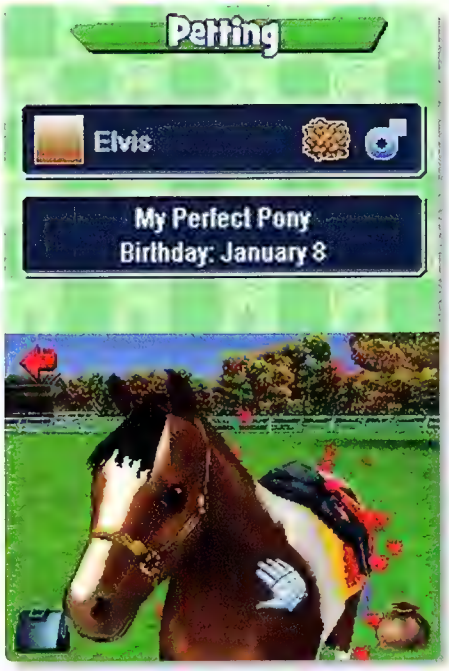
His point – that courses are primarily there to provide a foundation of knowledge – is one echoed throughout the industry. David Giles, Chief Operating Officer at Tantalus Media in Melbourne, says, "[The courses] are important as this is where a large number of our new staff will come from.

The value of these institutions for us is how quickly the new hire is able to come up to speed and fit comfortably into the work place."

And it's true. With more courses on offer in more institutes in more states, more people are doing courses – whether it's at their local TAFE, through a university or in a private institute like the Academy of Interactive Entertainment. It makes sense that the bulk of hires in the games industry will be graduates of the many certificates, diplomas, advanced diplomas and bachelor degrees now available. But not all of the hires will have such a background. The industry still takes on the self-taught, as Kevin McIntosh observed. You may have learned C++ from a tome at home, but your knowledge is still valuable. Just remember – it's not enough to simply say that you know xyz. Your knowledge must be demonstrated in a tangible way.

Australian developers work on a wide variety of projects on a wide variety of platforms – they obviously don't all require the same skills...

As both David Giles and Kevin McIntosh said, the most important part of these courses is that they provide a good foundation which individual developers can build upon as they impart their own lessons to new employees. Australian developers work on a wide variety of projects on a wide variety of platforms – they obviously don't all require the same skills and attributes from their employees. At the same time, having a solid foundation of the core skills required of everyone in the industry is important. The games industry is deadline driven. A studio can be a nurturing environment, but ultimately you're not going to get hired if you need to be guided by the hand from



Expecting to make the next Far Cry? Think again...

step one. Having a solid foundation of knowledge means you can easily slip into any development environment – be it Firemint or Epic – and quickly get your head around how it operates. To put it in coding terms, once you get your head around the theory behind programming – the part that's common to all languages – you'll be able to easily move between different languages, even if their syntaxes and APIs differ considerably.

Work

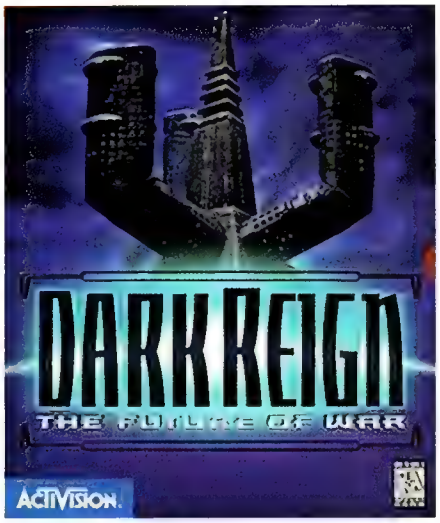
Kevin McIntosh feels that prospective employees are often ignorant of how serious the games industry really is. He says, "It's a real business and a real production, just like creating movies and television shows. There are hours of brainstorming, grunt work, testing and iteration that go into making the game."

Just think about how long some of your favourite titles have taken to come out after the initial announcement of their existence. The processes involved in designing a game, laying the foundations for it and then building it up component by component – the graphics, the audio, the programming – all of that takes a lot of time and the involvement of a lot of people. And all along you have non-technical people, such as those in marketing and public relations, involved. Developing games isn't all fun and games – a point echoed by David Giles. "Most [prospective employees] tend to think it will be back-to-back gameplay fun," he says. "There's quite a bit of that, but not as much as they probably thought."

Being a deadline-driven industry, those in the games industry can work ridiculous hours. They can suffer enormous stress. The end result of all this labour is a work of entertainment, sure, but that doesn't necessarily mean the process involved in creating that work of entertainment is always a barrel of laughs for those behind the scenes.

And that, in a roundabout way, brings us to another important point. "Some new employees might think they are coming in to work on the next best-selling first person shooter," says Kevin McIntosh. "Often that's not the case and most employees need to work on games they might not play themselves."

This is very true. Consider Tantalus' catalogue – mostly a string of tie-ins for DS, with maybe a couple of PSP and N-Gage titles. Last year they did the Nintendo DS game *Pony Friends*. It was published by Eidos and the background image of the official page is a lovely shade of pink. With flowers. And cute



pony pictures. Probably not what every Tantalus employee plays on the weekend, but it was a job. Just as there are gamers who finished *Crysis* and then sat around waiting for the next big genre title, there are gamers – little ones with pigtails – who want to play games like *Pony Friends*. There's money to be made from those gamers or, more accurately, their parents. Someone needs to cater to that market's demands.

Often, when speaking of the Australian games industry, writers will mention titles like *Destroy All Humans!*, *Powerslide* and *Dark Reign*, but the reality is most developers here work on tie-ins to popular films and television programs and ports from one platform to another. The Xbox version of *Unreal 2* was developed here. We're not saying there's anything wrong with that. Or that working on *Pony Friends* would've sucked. But those looking to get into the industry need to realise that, realistically, they're not going to be working on *Far Cry 3* or *Grand Theft Auto 5*. Even if they move abroad – entering job markets with far more competition, mind you – the studios that consistently develop such titles account for a relatively small chunk of the industry.

Attributes

As mentioned earlier, the qualities an employer is most concerned with aren't necessarily your qualifications. Certainly qualifications play a role in the selection of employees, but there are other, vitally important attributes they look out for. Attributes that aren't taught at any university or private institute.

Whether seeking a job as a programmer or an artist, the prospective employee needs to demonstrate that they're creative. After all, the games development industry is a creative one. One of the best ways to demonstrate this is through having a playable demo to go with your job application. Demos are very important in this industry. Having spent your own time creating something shows dedication and enthusiasm – important qualities in this industry. Furthermore, it shows not only the ability to finish a task, but also the ability to find a happy medium between attaining perfection and actually finishing a project in a reasonable timeframe. Demos need not be complex – a simple puzzle game can be enough – but they need to display your talents in your chosen field. If you're seeking employment as an artist, obviously your game should look good. Mods and independently-developed titles can look nice on a resume, but unfortunately with collaborative projects – unless you're a lone programmer teaming with a single artist – it can be difficult for developers to figure out the exact nature of your personal contribution. Don't underestimate the importance of the demo as, ultimately, experience is more important than qualifications. Designing and completing a project as a self-motivated as opposed to a graded exercise not only displays what a studio would consider good character, but would be a valuable learning experience.

Whether seeking a job as a programmer or an artist, the prospective employee needs to demonstrate they are creative.

Important, too, is the ability to think critically and analytically about one's own work and about the work of others. It's not a love of playing games that makes one suited to working in the business of creating them. Rather, it's the ability and the desire to analyse them – to figure out how they work, to understand what they successfully do and what they fail to do – that makes for a skilled games developer.


Powerslide – another strong Aussie title.

Family values

Gather round children, as I tell you a story about Atomic Live.

Time is money, as the old saying goes. Except to geeks, who value their time far, far less than their money. I knew this already, but I had it demonstrated beautifully to me at Atomic Live.

I was stationed on the helpdesk, chatting to those brave enough to face the slings and arrows of outrageous editorial staff. It was my first time at Atomic Live – normally it clashes with an annual Science Fiction convention I attend. Stop laughing in the back there!

Anyway, early in the day, an earnest looking chap hung around a bit, checking out the specs of the two testbench computers on show. He came back several times. Each time, he watched the second testbench running 3DMark. If he was looking at me like that, I would have gotten a little bit weirded out, to be honest, but because he was staring at the system, I struck up a conversation.

"Is there something I can help you with?"

"Is the graphics card overclockable?"

Justin assured him that it was, and walked him through the software briefly.

The day continued, with giveaways galore, and my little friend kept wandering back over, checking the test bench and wandering off again. It wasn't particularly unusual – lots of folk wandered over to the Helpdesk and away again over the course of the day. But this chap was just a bit more intent than anyone else, and he wandered over and back, adjusting the benchmark, running it, and noting down the settings and results about every fifteen minutes over six hours.

Eventually, just before Live closed, I cornered him to ask what he'd discovered in his benchmarking.

Turns out, he'd been considering the card in our test bench, and wanted to know what kind of performance he could squeeze out of it. If he could get enough performance, he'd spend the extra $50 over the card he was currently going to buy.

One way of looking at it would be to say that this guy valued his time so little that he was willing to spend six hours evaluating a potential $50 investment. When you consider that he missed a lot of aspects of Live participating in his little benchmark experiment, it looks even more foolish.

Knowledge is our primary currency, and we trade in it constantly.

But you know what? Justin and David and Dave and the rest of the crew here do this every day – running huge numbers of benchmarks to tell you whether an additional $5, $50 or $500 will deliver a performance return on your investment. We get paid to do that, obviously, but most people put the value of that sort of info just under $10 – the cost of the magazine.

What that $10 won't buy you is the experience of running the benchmarks yourself, to see the difference in each run, to feel the heat that the system produces and its overall stability. Putting a value on that is a lot harder, but I reckon that having free access to someone else's testbench system and benchmarking tools, and a day to play on them, may well be worth six hours of time.

In other spheres of geekery, such as open source software, just participating is recognised as being worthy of time, whether it's putting in hard coding slog or writing documentation. The whuffie – a term coined by Cory Doctorow in his novel 'Down and Out in the Magic Kingdom' to describe the social capital and boost in ego and reputation that results in doing something for others – is also a factor. Who do you think writes all those Wikipedia entries?

But the bottom line – excuse the phrase – in all of this is knowledge. The value of the knowledge gained by benchmarking a graphics card for six hours is worth far more than the time spent on it. It's a form of barter, used to demonstrate your credentials to other geeks, to swap for other information, build your reputation, and strengthen your whuffie. Knowledge is our primary currency, and we trade in it constantly. Understanding how things fit together – how tweaking the graphics card affects the overall performance, for example – that's the true value of spending those hours.

Geek economics: time is knowledge.

Now, if you excuse me, I have an experiment or two I want to run to test out my hypothesis.

Zara Baxter will take care of Cory Doctorow's whuffie any time he likes. Tell her your tales of whuffie
zbaxter@pcauthority.com.au

This film has advertising approval. Check the classification closer to the release date.

ONLY AT THE MOVIES
NOVEMBER 6

This film has advertising approval. Check the classification closer to the release date.

ONLY AT THE MOVIES
BOXING DAY

GAMEPLAY

GAMES, GAMING AND FILM COVERED... ATOMIC-STYLE

Games. We love to play them, and for some reason you love to know our opinion. Thankfully, we're talky bastards here at Atomic, and boy have we got some good'uns to share with you this month.

Top of the heap would have to be Far Cry 2, which takes open world FPS gaming to new heights of, well, open-ness. And shooting. Uh... okay, it's a better game than our writing, apparently, but go and read the review for a more indepth spray than that.

It's the heavy end of the year, for games, especially big action titles, so we've also got the latest STALKER title and Crysis: Warhead. One's a solid addition to its franchise, the other... well, wait and see.

Finally, we've managed to play the latest RTS masterpiece in the form of Red Alert 3.

One day we'd like to count up the rounds expended across all of our shooter reviews... such a thing!

HARDCORE CONTENTS

Engine Room

BlizzCon 2008

Liz Skuthorpe reports from Blizzard's annual gaming and software launching event.

Unless you've been living under a rock you'd know that US-based games developer Blizzard has been busily pimping their somewhat-annual convention BlizzCon. This year's event was the biggest yet, with gamers representing 27 different nations all getting together at the Anaheim Convention Centre in Southern California to check out the next big thing in Blizzard's calendar.

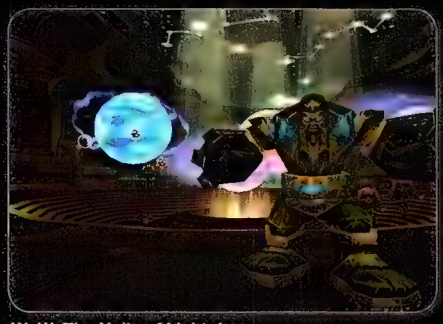
Blizzard has a busy schedule over the next year – *Diablo III* is in development, as is *StarCraft II*, but the first item up on agenda was the release of *Wrath of the Lich King*, the second expansion for MMORPG *World of Warcraft*, due for release mid-November. There were panels covering just about every aspect of the game from PvP to cinematics and everything was well attended. Unsurprisingly the twice-booked *Warcraft* Class panel was near impossible to get into, with queues running along corridors, stairs and around corners.

Eighteen thousand fans hit the centre this year, a massive increase on the 2005 and 2007 events – ticketing in 2008 was marred by website issues, with many people not sure whether they had actually bought tickets up to 24 hours after the sale opened. The original 15,000 tickets sold out in 15 minutes and knocked the site's server out of action.

In response Blizzard CEO and co-founder Mike Morhaime issued an apology and the company released another three thousand tickets by lottery. The people in attendance at this years' convention may be the lucky few, but you wouldn't be able to tell there had been such a fiasco based on how they threw themselves into the panels, events and Q&A spots.

Diablo 2: Witch Doctor battles with firebats.


WoW: Kvaldir fights a Tuskarr in Borean Tundra


WoW: The Halls of Lightning.

Thursday

Registration opened at 4pm Thursday afternoon and the queues quickly become monstrous, snaking around the foyer, out the door and wrapping around the building – it was utter chaos as the alphabetically grouped lines became continually muddled. It' was a bit easier over in the press, VIP, and All Access areas, but we still had to wait some time for the goodie bag and entry pass.

And speaking of goodie bag, everyone needs a gift bag filled with slimy Zerg Creep, trading card starter sets, Blizzard Authenticators, FigurePrints emblems and (more disturbingly) a personal hand sanitiser. The Goodie Bag was fully stocked with all things related to Blizzard, but just about everyone was after their Big Blizzard Bear activation code.

Unlike most in-game loot this card allows players to choose a server and a faction to access the mount as it is [Bind to Account] rather than [Bind on Equip] or [Pick-up]. This means players are able to learn the riding skill for the Big Blizzard Bear on all their characters, and the bear speed will change according to the riding skill of the particular character that has access to it.

Vendors on the show floor were obvious choices, such as Jinx! Clothing, Ruby's Halloween stand (for all your undead rogue mask needs), FigurePrints and the Blizzard Store itself. Merchandise sold out with alarming regularity; we only braved the Jinx! store on the last day, waiting until foot weary attendees staggered back to hotel rooms and the queue lasted only 20 minutes, as opposed to six hours. This did however mean that there was not a single plush murloc left. QQ.

Friday

The convention doors open at 10am and people began to trickle in for the opening ceremony, and to get their hands on one of the hundreds of gaming machines running *Wrath*, *Diablo* and *StarCraft* – queues for these machines were long over the whole weekend. The RTS and *Warcraft* competitions kicked off first thing – round one and two leading straight into the quarter finals for *StarCraft*, *Warcraft III* and the *WoW* Tournament.

Jay Mohr was back this year to host the Machinima, Costume and Dance contests – the Undead girl who won the dance contest absolutely deserved it for a) being awesome and b) staying in character the whole time (**http://tinyurl.com/54j9fh** - the winner is toward the end and worth waiting for). But it's sometimes dangerous to watch this kind of... spectacle. If we never see another teenaged kid in a stripper outfit doing the Ogre/Moonkin/Chris Farley SNL dance, it will be too soon.

Saturday

The second day kicks off with a panel lead by *WoW's* lead level designer Cory Stockton on the new PvP elements introduced in Wrath; new arenas and the new world PvP zone Lake Wintergrasp.

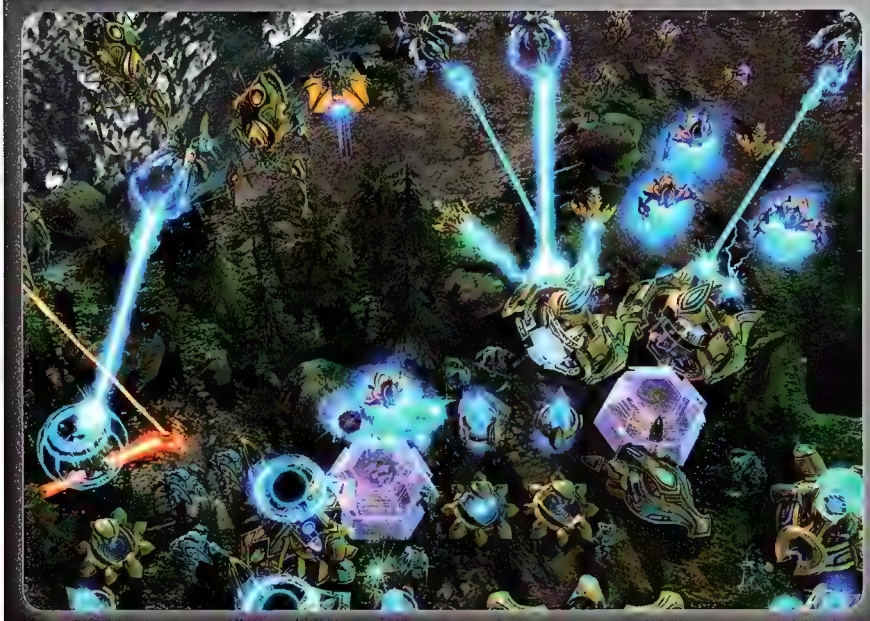
The Ring of Valor and the Dalaran sewers are two new arenas being implemented into the game, both using new mechanics to lend a different feel to PvP play. The Arena of Valor is a gladiator-style area that places opposing teams extremely close to each other at the start of the match and uses rising and falling platforms and a fire obstacle to force players to choose damage over movement and create rotating line of sight issues.

Dalaran Sewers is a Fight Club-style underground arena in Dalaran city. It's a small

If we never see another teenaged kid in a stripper outfit doing the Ogre/Moonkin/Chris Farley SNL dance, it will be too soon.


Level 80 Tauren Chieftain rock out.

StarCraft II



Unsurprisingly *StarCraft* featured prominently in the panels and Q&A sessions with the developers; it's been ten years since the series launched and fans have been itching for some more Terran, Zerg and Protoss action. Developers were keen to let the fans see what was in store for gamers in the next release and announced that *SCII* will be split into three different releases; *Wings of Liberty*, *Heart of the Swarm* and *Legacy of the Void*. This was the biggest announcement made at the con and fan reaction was mixed to say the least, and in many cases outright negative.

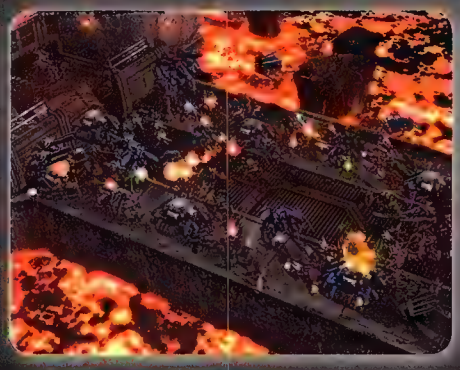
Blizzard insists the decision comes out of their attempt to include more plot and narrative through the three campaigns and that there will still be full multiplayer functionality for all races when the first campaign hits the shelves. It remains to be seen whether the 26-30 complete missions will appear in that first Terran campaign and whether the single race release will be enough to keep gamers interested until the Zerg and Protoss campaigns make it out.

At the *StarCraft II* Gameplay panel the audience was treated to a spiffy cinematic featuring Zeratul and Kerrigan cutting down Zelnaga and we also got a sneak peek at an animatic of Kerrigan's abandonment on-planet and subsequent Zerging and hopefully her transformation into the Queen of Blades – this should look pretty kick-arse when it's finished.

enclosed arena that sees teams entering from sewage pipes at both ends; and dropping down into the arena at the start. Players who stay too long in the pipe will experience a knock-back style effect, including rushing water, that throws them into the arena. Dalaran Sewers will also feature a central water feature as a line of sight block, with a knock-back as an 'area denial' mechanic to stop players from attempting to live inside the water feature.

World PvP zone Wintergrasp has been implemented in the beta and will have extra features added to it before the expansion. Stockton announced one of the major additions to the PvP non instanced zone will be players being able to PvP for both PvP and PvE rewards. Wintergrasp is a fortress that can be captured by either faction on an 'Attack then Defence' basis. Once a faction has won control of the fortress itself they gain the benefits of controlling the area; including access to vendors and the opening of an instance to all members of that faction. Tokens will also drop from non-PvP world bosses while that faction is in control of the base, similar to the spirit shards in Auchindoun, which can then be exchanged for vendor goods.

In order to obtain control players can use



StarCraft II interview

atomic Today's announcement that StarCraft II will be released as three different games has lots of fans excited and some unsure. How did that decision come about?

Chris Sigaty: Like a lot of these decisions, it came about after we tried to think too big. We had more and more ideas come in for the story and the plot and in the end we realised that we had too much for just one game. The decision then became, well... do we cut it down, do we keep it and release something huge or do we split it? It did take us a couple of months to really decide what we wanted to do with it and eventually we went with rolling out the three instalments.

But we're certain that there will be enough in the way of missions in the Terran campaign to keep players happy – there are like 30 complete missions there already and it has multiplayer functionality. Though I was pretty nervous when Rob (Pardo) said he was going to announce it; you never know how people will react.

atomic How long will we be waiting for the first release date?

Chris Sigaty: Well, we don't have a shipping date at all as yet – the game's still in development. We do have a company-alpha testing phase and so we're doing that at the moment. Once that's done it should be going into a public beta test, so that may be next year sometime. We're still finishing 'Wings of Liberty' – that's our intention before we start in on the next two.

atomic In countries like Korea pro-gaming is practically a national sport, how do you maintain balance when faced with those kinds of players?

Chris Sigaty: I think making sure that the game functions on lots of difficulty levels is the best way to work around that. So you have people working their way up through the difficulty and keeping the game interesting, and challenging for them on single player and usually if you're playing against others you'll be constantly challenged by what they're choosing to do with units at their disposal.

atomic What's your favourite aspect of StarCraft?

Chris Sigaty: One of the coolest things is how serious players still figure out ways to really surprise you. You'll think you've worked it all out and that you know all the mechanics and then these professional guys will just build it up and build it up or knock everything down. I love that.

siege vehicles to attack destructible buildings and other players, while defenders will have access to 'emplaced cannon' weapons to pick off attackers in the field below. "We've worked really hard to maintain the balance between the players and the vehicles. If you have enough players on the ground you can definitely take out a vehicle." Stockton seems pretty sure that having this many players in the one area won't see a return to early Warcraft server crashes. "We've spent the majority of our time making sure that our servers can support the number of players in the game."

The faction in control of the area will also have access to workshops and be able to create siege engines for the next part of the battle, with different ranks of vehicles available to different players "Someone who's really contributed to the fight is gonna be the one in the really good siege vehicles".

Tom Chilton announced some other elements that should be implemented in a future patch, though they won't be ready for release, specifically for players who feel like they spend all their time queuing in cities for battlegrounds – the option to queue from anywhere in the world, including the ability to queue while participating in world PvP.

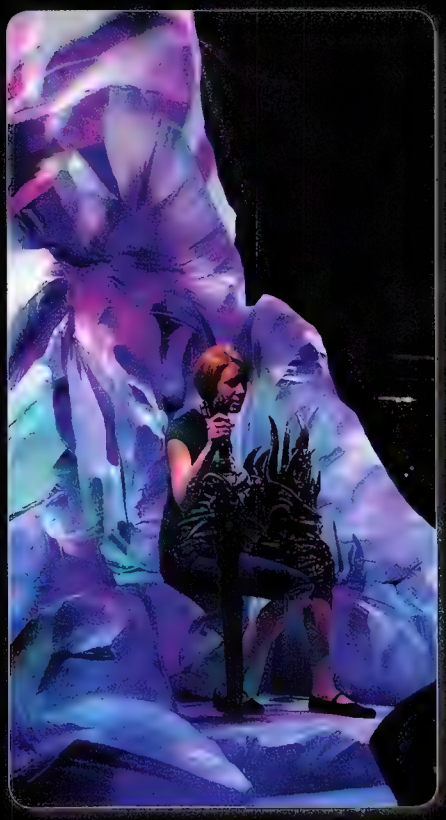
"Someone who's really contributed to the fight is gonna be the one in the really good siege vehicles."

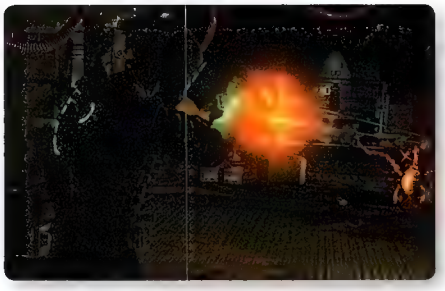
The musical finale

Video Games Live and Level 80 (level cap!) Elite Tauren Chieftain should be at every event where nerds are in attendance. And you know you're at the right kind of party where the band gains the Achievement "Making Thousands of People Yell 'Mrghghlsghgh!'"

Fun times.

For more in deopth coverage of the event and its announcements as it happened be sure to check out **www.atomicmpc.com.au**





Dead Space

Put on the brown trousers for this sci-fi descent into hell...

Are you one of those types who looks at survival horror games and scoffs "Survival horror? Haven't met a horror I can't survive yet." If so, well, bravo to you, and here, have a nice lotion for those mighty balls of yours – they must chafe. We can be a tad on the delicate side here at Atomic, some more so than others, so we're not quite so blasé about EA's latest...

Let's just say that after the first chapter of *Dead Space* – at night and alone of course – we had to go through the office, turn on every light, and then put on some loud happy music to chill out.

And then change our pants.

Dead Space takes survival horror into space, aboard the lost – and now unfortunately found – USG Ishimura, a 'planet cracker' out in the far reaches of space mining vital minerals. Your job is to find out why it went off the grid, and fix the problem; except the problem turns out to be much more complex than a faulty transmitter.

Without giving too much away, something has gone horribly wrong on the Ishimura, and it's crew has either mutated, gone insane, or been torn limb from bloody limb by the time you get there. You take on the role of engineer Isaac Clarke (special prize to whomever picks the references), and it's up to you to rescue the crew of your rescue ship and get off the stricken Ishimura.

The gameplay is tense and fraught with moments of sheer bloody terror. We're saying 'bloody' a lot because the game is just that, quite literally. Torn flesh sprays out blood in copious amounts; it smears the walls, and you may well end up pissing it in some of the nastier set piece fights. To say this is a game of visceral shocks is akin to saying World War 2 merely had something to do with Germans. The game's GUI-less design – all relevant info is actually displayed literally on your armoured engineering suit – helps keep you even further immersed in the unfolding horror.

Every aspect of the gameplay and graphic design is engineered to evoke dread – the fitful rumble of the engines, far off howls and screams, the creak of suspended gantries and the strobing of emergency lights. And that's without even mentioning what you're fighting.

Dead Space's monsters look as though they could give John Carpenter's Thing a run for its tentacle horrible money. Their flesh is slimy and putrescent, dripping blood and maggots. Limbs contort in the wrong directions, or have atrophied entirely in favour of other, more haphazard arrangements of stabby appendages. And it's these limbs that form the core of the action in the game.

Being an engineer, you're far more comfortable working with tools than guns, and being a mining ship, there are many such tools at your disposal. You learn early on from reports – and hastily scrawled graffiti – that the gibbering hordes are too tough to take down with body shots. You have to shoot limbs off, usually two or three, to kill these things. Some are slow and easy to take down, others are fast and take a little more care in how you target them. But it's when you get a three or more coming at you that you really need to think strategically.

Thankfully, cutting and slicing weapons aren't the only tool in your box. You've also got the ability to freeze nasties in place using stasis equipment. This slows them down, though you only ever have very limited reserves of energy. In a big fight, the choice of what targets to slow down, and when, and then what order to shoot, disable and destroy, can make the difference between life and a very messy death.

Dead Space is a great combination of a slow burn story, moody atmospherics, clever hard SF touches, and brutal gameplay. It's a near flawless example of great game design. **DH**

PC/360/PS3 (tested on PC)

Developer EA Redwood Shores
Publisher Electronic Arts
Website www.deadspacegame.com

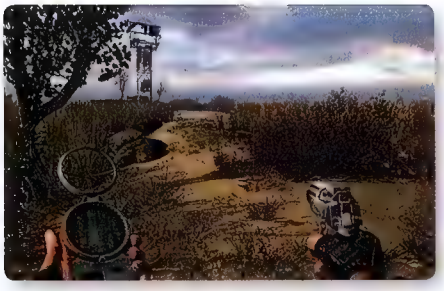
Graphics 84
Really strong, but lacking in tweaking options.

Gameplay 92
Good mix of timed, puzzle-based and action encounters.

Sound 96
Superbly atmospheric and gruesome.

Overall
Scary and exciting by turns, this is a game that begs to be indulged in dark room late at night.

91%



S.T.A.L.K.E.R: Clear Sky

The prequel to one of the most anticipated shooters of recent times is here. Reason to celebrate? Hmm...

S.T.A.L.K.E.R. is a game that's synonymous with two things – incredibly long and drawn out production, and making game writers cramp up when writing any review or article on the title. People were being excited about the game back when Atomic was still a new kid on the block in the publishing world. When it was finally released, it was plain to see that a huge amount of care and work had gone into *S.T.A.L.K.E.R.*, but it was also plain to see that the end result was far less than the sum of its parts.

Clear Sky, a prequel to *Shadow of Chernobyl*, cleans up a lot of the original's shortfalls, but somehow manages to also lose some of its charm into the bargain.

First up, as a prequel, any real sense of drama is diminished by knowing exactly how things are going to end up. Further, the fact that your character in *Clear Sky* – a mercenary called Scar – is not even mentioned in the original might well lead you to believe that all your efforts in this game are going to see you killed off anyway. Still, a compelling story is present, and the developers have taken clear pains to create something very different to drag you into the experience.

Like in *Shadow*, you're a loner, a man with a mysterious power, and it's up to you find your way in the apocalyptic wasteland that surrounds Chernobyl. In this iteration, however, there are many new ways to play the game, thanks to the organic faction system that underpins the game.

The Clear Sky faction is a group of scientist trying to understand the radioactive and highly dangerous 'Zone'. They are also your first loyalty in the game, but there are six other factions fighting for dominance, four of which you can hire yourself out to. As these factions wax and wane, more options in your equipment and inventory open up.

S.T.A.L.K.E.R. always promised true open world gameplay, but it kind of cheated in the original and it almost ditches it completely in this iteration. This time around you need guides to move around, and they blindfold you each time. Each zone is quite large, though, so you do still have many options as to how you approach each tactical challenge. And challenging they are...

The game is very fluid, and the AI is often more than capable of looking after itself. This is good in some ways, but when you've had a comrade desperately calling for help for the last five minutes, and then you show up to find that person hale and hearty and surrounded by dead bodies, you might be a little miffed.

Especially if you've had to waste copious amounts of ammunition blowing away the local mutated wildlife just to get there.

Combat is more deadly, it seems, and we found ourselves not only wandering into more turn-you-inside-out anomalies than *Shadow*, but also getting one-shotted a lot more. Realism is good, yes, but it can get frustrating when stray fire from a nearby firefight takes you out.

The game looks a lot better, thanks to an updated X-ray engine, and even the recycled content has never looked so good. AI, as we've said, can be strong, and can now use cover and some weapons far more effectively, but you'll still often find two people staring at each other through a wall and unable to work out how to walk around it.

The atmosphere of the flawed original may be gone, but despite some serious new issues there's still a lot to like in *Clear Sky*. Some of its improvements are good on paper but work against it, while others simply move the game in other directions. Regardless, it is a unique FPS experience, and as such we can't help but applaud its developers for sticking to their guns. **DH**

PC

Developer GSC Game World
Publisher Red Ant
Website http://cs.stalker-game.com/en/

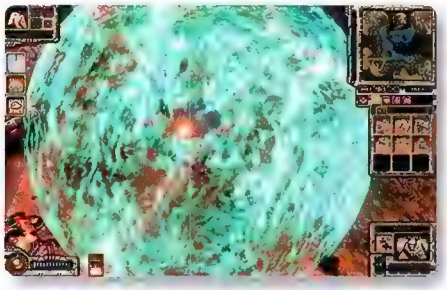
Graphics 84
A clear improvement, but still no Crysis or Far Cry 2.

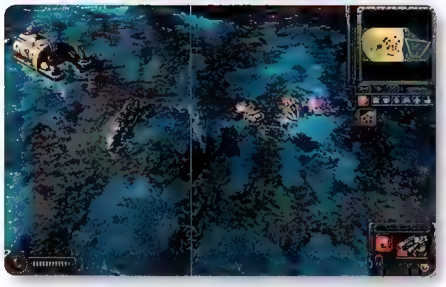
Gameplay 76
A curious mix of old school and new ideas.

Sound 80
Always moody, but some odd musical choices.

Overall:
Compelling despite itself, but requires serious dedication.

78%





Command & Conquer: Red Alert 3

The quintessential RTS to play this year. Period!

Imagine for a moment, as you place the disc tenderly within your computer, staring blissfully at the installation screen... you tentatively click on the icon, hands trembling from excitement, as the EA logo saunters seductively on-screen, thinking that it really can't get any better. That is – until the FMV starts. You're suddenly thrust crotch-first into a pants-wettingly orgasmic six or so minutes of vivid HD video, detailing the backstory and setting the mood for the entire game. But before we tell you more about this strangely erotic intro, let's have a quick recap of the series thus far.

Once upon a time...

The original Red Alert game was based around the premise that Albert Einstein (scientifically acknowledged genius that he is) created a Time Machine, and went back in time to remove Adolf Hitler in an attempt to prevent WWII from ever happening. Unfortunately for him, his giant brain didn't include very much common sense, as this allowed the Soviet Union (led by Joseph Stalin) free reign to attack Europe. Eventually the Allies banded together, and managed to quell the Soviet uprising – temporarily.

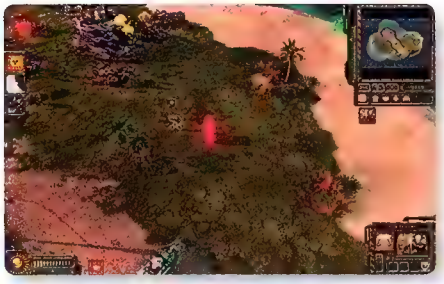
Red Alert 2 brought us back into this alternate universe. It turns out that the Soviets hadn't forgiven the Allies at all for showing them up the first time around, using mind-control technology to detonate the Allies' nuclear missiles – leaving them wide open for invasion. The bitter struggle raged on, though the Soviet's lack of technological prowess eventually become their undoing, driving them further and further back across the globe, until they were quite literally minutes away from defeat. Which is where Red Alert 3 begins.

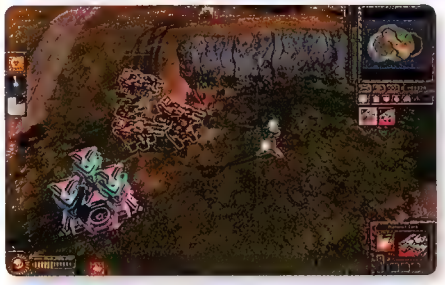
Premier Cherdenko (as portrayed by the charismatic Tim Curry) hurriedly decides to use the Soviet's own version of the Time Machine (naturally red and bronzed) to go back in time once again and change history. Now, we know how well this worked out the first time, so you can't really expect things to get much better a second time… right? Cherdenko travels back to a Physics convention in Brussels, 1927, where it just so happens that Einstein was giving a presentation on one of his then-radical new theories. So, with a (literally) killer handshake, Einstein is removed from history, zapping the Premier back to the second alternate reality created by the series thus far.

Upon his arrival, he is informed that the Soviets have claimed most of Europe, and are driving the pathetic Allies back at an impressive speed. All seems well, until an unsolicited call from Emperor Yoshiro (played by Star Trek's George Takei no less!), leader of the Empire of the Rising Sun, comes through; declaring war upon both the Allies and the Soviets. Due to Einstein's untimely demise, it would seem that he was never around to develop nuclear weapons, leaving Japan to develop into a major world power unchallenged. Not only that, but President Howard T. Ackerman (Jonathan Kimble Simmons – J Jonah Jameson from Spiderman fame!) declares that due to the increased threat, the amount of resources that America is providing will be quintupled!

The folks at Pearl Harbour never saw this Japanese hovertank rush coming - codenamed 'Chantelle'

"You shrunk my battleship!" - Dreadnought after a Cryocopter attack





Rock, scissors, dirigible

The campaign of this game involves the three factions outlined above, each with eight or ten missions. At the commencement of each one, you'll get an FMV (Full-Motion Video) outlining the story, then a briefing on the mission parameters by your lovely assistant. Each and every single mission has been built around either a single player, or for the first time in an RTS, a cooperative playthrough! This means that you and a friend can both work together, sharing the campaign and pooling your efforts against whichever side you happen to be facing at the time. In the event that you don't have friends (or, more likely, simply don't want to play with someone else), your ally is a computer-controlled force that is actually very helpful. There are also multiple allies that you can play with, and each has intro videos as you begin the mission, as well as motivational statements throughout.

You'll even get challenged to fights, insulted and have your skills teased in the skirmish matches, with the video giving a surprising amount of depth to the already very intelligent AI. Some unconventional strategies were used against us that certainly threw us off-guard, and defeating them was very satisfying – mostly due to being able to watch their reaction to their inevitable defeat.

The force balancing has never been better, with each side having their own signature quirks and strengths. As the Allies, your buildings will be ordered and built after a small wait, and ready for immediate placement on the battlefield within reach of your ground control (given by a Construction Yard, or other significant building – power does not count). They also have a focus on special abilities (each and every unit in the entire game has one that is extremely beneficial if you know how to use it). One of our favourites is the Cryocopter, that uses its 'Strong Homogenous Residual-Interactive Neutron Kinetic' beam (points for guessing that acronym) to greatly reduce the combat effectiveness of enemy units, as other units come in to mop up.

Playing as the Soviets will yield a different experience, with buildings placed on the ground within ground control, and left to build to completion in the physical world. The Soviets have a very large focus on brute force, shown by the delightfully destructive Apocalypse Tank and Kirov Airship.

The Empire of the Rising Sun is completely different to both these playing styles again, and any other RTS you've played before. Buildings are initially produced as a triangular-shaped unit from the Construction Yard, and are deployed anywhere on the map that you'd like them to be. Every Rising Sun unit also has a special ability (including a giant proportion of transforming units) that causes each unit to be a dual-purpose tool of war.

Resources are simplified to a single Ore Refinery per resource node, lessening your resource micromanagement and leaving you to focus on attacking. Buildings can be built on land or sea (except the barracks, war factory and naval yards, which stay on their respective areas). This game really is nothing short of revolutionary, and we've barely scratched the deep surface of this extremely enjoyable game. **JR**


Tim Curry is amazing as the Premier, with a passionate style, and flawless accent

PC

Developer EA Los Angeles
Publisher Electronic Arts
Website www.ea.com/redalert/index.jsp

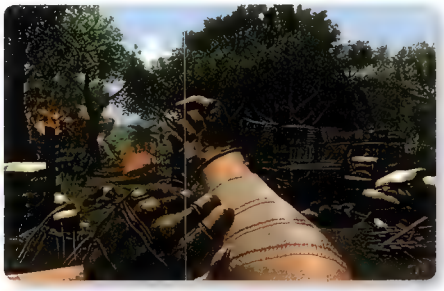
Graphics 96
Heavily tweaked C&C3 engine, in gloriously colourful detail.

Gameplay 98
Mastering this game will be at the top of your list for many months.

Sound 94
Exciting battle music, intense effects and a remixed Hell March. Fuck yeah.

Overall
One of the most enjoyable games we've played, ever

96%



Far Cry 2

atomic hot award

FPS nirvana or just another shooter looking for an edge?

We had a look an early look at Far Cry 2 code a couple of issues ago, and we liked what we had seen. Of course, we were reserving judgement on some aspects of the game until we saw more final code... which we've now poured a metric frack-tonne of sweat and time into. Far Cry 2 may not be the perfect FPS, and it's not without some serious flaws, but at the end of the day it's still an amazing achievement in first person shooters.

For those who missed our preview, the game lets you choose your in game persona from about a dozen hard bitten mercenaries, and then throws you into the deep end on the trail of a rogue arms dealer selling weapons to all sides in a messy – and failing – African nation. Things don't go your way from the outset, though, and after contracting malaria and getting cut loose from the people who hired you, you find yourself at the mercy of whomever will give you work. Dirty work, too.

The game opens in a familiarly linear fashion: go here, deliver this, do that. But it soon flowers into an open world to rival any GTA game. There are two major factions in the early game, each keen to take advantage of your gun for hire status – the LFCC and the APR. These are the two major players in the civil war, and in the ceasefire-zone of the town of Pala the two have offices at each end of a main street. But leave town and the safeties come off...

In addition there are numerous side-quests, in effect, that you can pick up from the radio towers scattered about the jungle. At these, a mysterious figure directs you who to kill – there's no explanations, and even the first mission you get from here is a rather shocking breach of local protocol. Then there's the missions you perform on behalf of the local humanitarian underground, in return for which you get vital malaria meds. And, finally, there's missions you can perform on behalf of your various merc buddies.

It's a rich tapestry of violence and betrayal, and it guarantees there's always something to do, and a different way to do it.

That's the key to FC2's open world – with all the above complexity, combined with weapons that degrade and misfire or worse, every engagement is its own narrative. Take one of our missions, where you are tasked with taking out the irrigation system of a farm that... well, you've got to take it out. On the way, you get a phone call from a buddy, who suggests that if you help him out first, he'll do something to help you in turn. So off you go to the local airport after securing some defoliant for him, and he promises to plaster the local jungle with it once you've completed your sabotage mission, making it easier to spot any badguys blocking your way.

Sounds great and easy, but halfway through sneaking into the farm (we could have gone in guns blazing, but hey, God loves a sniper) the dormant malaria infection wakes up and you have a moment of disorientation, walk into the open, and get spotted.

From there it's a running gunfight the entire way, until you manage to find a good sniper roost, only because it's raining your weapon has rusted, and jams, and then literally blows up in your hands. More running, more death, and the mission is finally over. Your pal screams overhead in his little Cessna and the jungle melts before your eyes... only you also hear your buddy calling for help, as he's been shot down.

So you gather up what weapons you can find, then rush through the jungle to ambush the ambushers. But because you got caught up by a carload of angry mercs driving by at the wrong time, you get there late, and you have to use your last syrette to bring your buddy back from the brink of death. That, or let the brush fire that's broken out kill him before he bleeds out. We're nice guys, so we saved him so that he can help us again another day.

That's one of the more involved missions, of course, but there are simpler ones you can take in between working for the big players. You can work for local gun shop owners, and earn cash as well as unlock new weapons, gear and upgrades – all this takes is a simple ambush of a rival gunrunner's trucks. FC2 essentially takes the same approach that good MMOs take, that you should be able to do something meaningful in even a small amount of time, and applies it to the FPS.

And you get all of this gaming in a wonderfully realised and graphically rich African locale. On our test rig, with 2GB of RAM and a single GTX280, we were able to play the game at near max settings and with no real frame rate problems – even on 8-series NVIDIA hardware the game is playable, though we would recommend an upgrade to take advantage. The complex environments of grasslands, leafy jungles and raining swamps are simply lush in their execution, and the day night cycle – which you can adjust by crashing out for a few hours in a safehouse – means that even familiar locations can become fresh and new. The game's big draw, realistic fire propagation, is a neat little trick, and thankfully not overused. It adds a nice wrinkle to the more chaotic firefights, and standing and watching a burning tree fall apart at sunset is suitably dramatic, but it's not the gameplay revolution it's been touted as.

Rather, it's just part of a whole that manages to overcome hitscan issues, some indifferent AI (though it is an aggressive AI, we must say) and motion modelling, as well as the usual problem of a man in a t-shirt taking a whole clip of .45 calibre rounds to the head before dying. Things like that make the immersion the rest of the game aims for difficult to maintain, but it's not an insurmountable problem. Plus, the constant respawning of enemies in cleared checkpoints can be super repetitive. For some, we admit, this may be a game breaker. We can live with it.

And then there's multiplayer. We've yet to properly enjoy the online action (the joy of early reviewing), but we have had a chance to see the map editor in action, and this is a true revolution. Even on the 360 version of the game, creating a map is simplicity itself, and it's quite possible to create a large map, with vegetation, geographical features and buildings in minutes. This part of the game alone is almost worth the price, if map-making is your thing, and we're sure this will only add to the game's longevity and impact.

Once modders get a hold of the underlying code, we're sure FC2 will be one of the most important game releases of recent years. This is a game that will only get better with time. **DH**

PC/360/PS3 (tested on PC)

Developer Ubisoft Montreal
Publisher Ubisoft
Website farcry.us.ubi.com/

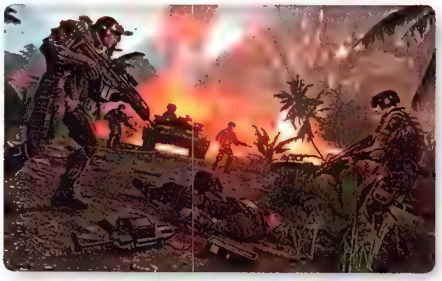
Graphics 91
As good as Crysis, but far easier on your hardware.

Gameplay 94
Some issues with ballistics and respawns, but still satisfying.

Sound 86
Good music, but many weapons sound a little weak.

Overall
Despite some issues, this is a towering achievement of FPS gameplay.

93%



Crysis: Warhead

Time to get back into your muscle suit, batter some Koreans, and dodge freezerays.

In the original *Crysis* you played the role of a special forces type called Nomad. He was part of a larger squad dropped onto an island somewhere in South East Asia, ostensibly to save some kidnapped scientists from aggressive North Korean soldiers, but that actually ended up engaging in a fight against alien invaders to save humanity.

You know – standard FPS fare, really.

One of your squaddies was an angry and scarred young man called Psycho, and if that's not a poorly chosen callsign, I don't know what is. Regardless, his crazy cockney antics must have played well with the game-playing public, because now he's back (with some brand new inventions) in the starring role of *Crysis: Warhead*.

Straight up, we're inclined to like this game for one simple reason. It's a standalone expansion, at an expansion price. $44.95 for a game – though short, we admit – and full multiplayer package is pretty impressive.

The story basically fills in the blanks of what Psycho was doing on the other side of the island while the more clean-cut Nomad appeared to be hogging all the world-saving action. Since there's no longer any mystery to what's really going on (alien invasions, military double crosses, all that...) the action kicks off harder and faster than the original. The different feel of playing as Psycho also come into play, here, as he tends to play by a very different set of rules.

The game centers around a hunt for a container crate with a nuclear warhead hidden inside, and features some great set piece encounters. One in particular was hugely entertaining – and ends with Psycho effectively breaking down before getting his shit together and getting on with the mission.

Of course, if you didn't like the original *Crysis*, than there's not a lot that's going to draw you into this iteration. The nano-suit gameplay is still much the same, and the slightly more linear and direct approach to missions makes the game even less open than the not-all-that-open. There are three cool new weapons to play with, though they're really just variations on already established themes, but on the upside there's a mess of new weapon customisation options to play with.

Also improved are the graphics. The CryEngine 2 has been significantly tweaked, allowing the game to run smoother and look better than ever. So, if you've a system that could handle the original, Warhead will be an even better, smoother experience.

Multiplayer, as we mentioned, is included, though again it's a rather different affair to the original. Pretty much every aspect of killing-your-mates-for-fun has been re-balanced, from the nano-suit itself, to weapons and even vehicle handling. Even more curious is that multiplayer aspect of the game is a standalone title – *Crysis Wars* – and actually packaged on a separate disc.

Despite all its not quite flaws, *Crysis: Warhead* is one of those rare gems in gaming – a title that's so cheap that you almost can't afford not to have it for the amount of entertainment it offers. It's also a great way for those who may still be wondering if *Crysis* is their thing to have a look at the game without shelling out full price – though that may spoil the slow burn of the original's plot. And even if you don't give an alien's cuss for the single player game, there's still a very tight online matchup to enjoy.

A lot of other publishers could learn a thing or two about how to release an expansion form Warhead. **DH**

PC

Developer Crytek Budapest
Publisher Electronic Arts
Website http://crysiswarhead.ea.com/

Graphics 94
Still a system hog, still just about the prettiest.

Gameplay 88
An improved experience all-round.

Sound 89
Great effects work, and some solid voicework too.

Overall
No seismic changes, but enough tweaks to make this a must-have for Crysis fans.

91%

atomic LIVE 2008

Atomic LIVE 2008-10-18

The great day has been and gone, but the memories remain...

October 18 was the day. Having a great time was the goal.

I think anyone who attended would agree... that goal was met.

At Badgery Pavillion on a clear and sunny day, nearly over 2,000 Atomicans, gamers, vendors and sundry lovely geeks attended Atomic LIVE this year, making it easily our most successful day yet. The day began early for us, and for the all the vendors and contestants in the ASUS-sponsored World GameMaster Tournament, but for the people who had been waiting for hours to get in, the day really kicked off at 10am – when the doors opened.

The sudden influx of hundreds of eager tech fans was something to behold, and it never fails to amaze just how quickly that special show atmosphere can take off. Once through the doors there was a host of stuff to see – ASUS, Coolermaster, Thermaltake, Altech, Protac, AIE, AMD, Viewsonic and more numbered amongst the vendors, while there were retail stands from Madman Entertainment (cheap anime boxsets FTW!), MegaWare, Games Warehouse and AusPCMarket.

As if that wasn't enough, there were giveaways, talks and competitions on the mainstage practically non-stop. Our speedbuilding competition went off – congrats to Ben, our now two-time speed champion, and Guitar Hero proved very popular indeed. But it's the giveaways that really drew people in, from the likes of Sapphire, AMD and Altech... we must have seen many thousands of dollars worth of cool tech handed out to happy techies over the course of the show.

But mere words can never truly sum up the fun of the show, so we've gathered the best shots of the day, so that those there can remember for ever, and so those who couldn't make it can get an idea of why people travel from all over the country to attend.

See you next year!

Can you imagine happier faces than these? We didn't think so.

Nearly everyone who attended walked away with some form or prize.

Even before the day began, happy crowds were forming outside Badgery Pavillion.

David Hollingworth, Atomic's editor, shows off some sweet new tech.

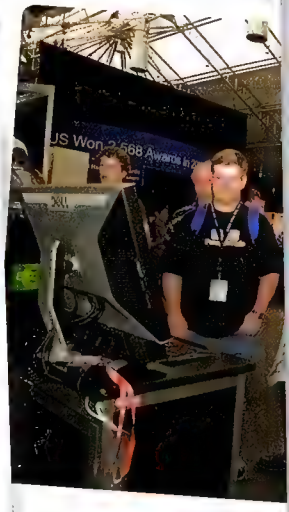
"Really good day. I won a graphics card... whoo!"

Extreme concentration was shown by all competitors in the National Tekken 6 competition.

"It was most excellent. So much fun stuff happening and far, far too many tempting stalls (damn madman! I shouldn't have taken my credit card with me)."

Guitar Hero 3 proved popular, and next year it will be back bigger and better than ever!

"Oh wow!"



Attendants playing Far Cry 2 – this was the first time the game had been playable and available to the public!

Ben, and his fans, after he wins the speedbuilding comp for the second year in a row!

"It would have to be the best day I have had this year. What a blast! ATOMIC FOREVER!"

"So much funnage - I had an amazing time. Always incredible watching the LAN Games Gods Lambo and Mordain!"

There were many great talks from our generous vendors. Here's AMD's Caleb Leung.

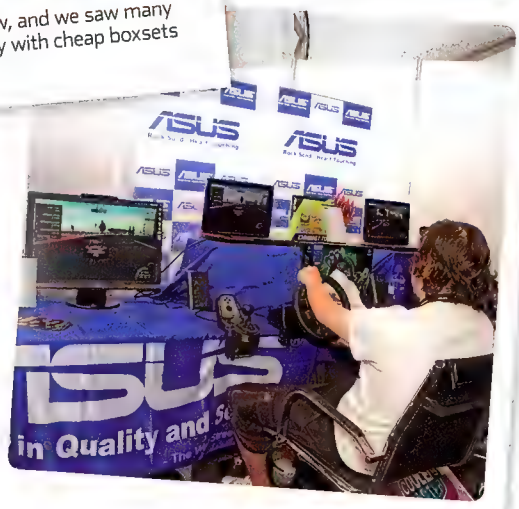
Speedbuilding – skill, precision and PC smarts all come into play.

Without the support of the vendors we deal with every day in bringing you news and reviews of the latest gear, Atomic LIVE simply wouldn't be possible. What's particularly marvelous, for me, is just how much they enjoy interacting with the Atomic audience. In the words of one, "We have bigger shows, but none better – these are the real people we want to connect with."

– David Hollingworth

Madman proved a popular draw, and we saw many happy Atomicans walking away with cheap boxsets at the day's end.

Introducing... the vendors and retailers of Atomic LIVE 2008!



Games Warehouse always had people at their stand, looking for gaming bargains.

Audion Innovision's speaker-filled presence was a hit, and we expect many people visiting are thinking of Razer gear for their PC.

AIE's stand was a wonderful spot, teaching people all about how to start a career in games development.

AMD – fruit bar not in shot! – had some very sexy gear on show. Popular, too!

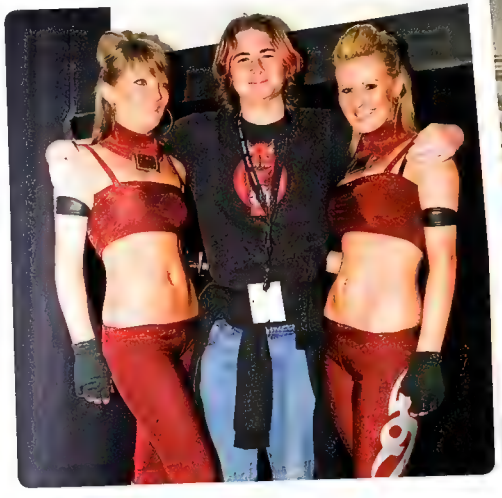
One of the great things about LIVE is seeing people have a chance to get kit shown to them by the experts.

Far Cry 2 was popular on the day, and we review it this issue. Turn to page 92!

Altech Computers was – as always – very generous with its gear!

Do you think it's the prize or the girls making him so happy.

We don't have a hard sum of the stuff given away on the day, but it was well into the thousands of dollars worth of kit.



Here's Caleb from AMD again, making one young kid very happy!

Big Kev from Altech, teaching the young. Bless him.

This guy won a mouse last year, and another this year just in time to replace it!

WGT

WORLD GAMEMASTER TOURNAMENT

WGT Grand Final

The best of Australian gaming, under one roof.

This year's WGT was a paragon of a gaming tournament, even if we do say so ourselves – it ran super smoothly, and featured a host of the greatest gamers our country has to offer.

The technical setup was a thing to behold – 30 ASUS PCs, sexy Razer peripherals, ten 50in plasmas and a giant projector... that's a lotta tech. And it all helped show off some incredible skills and kills on the day. And speaking of kills, here are the winners of the prestigious CounterStrike: Source competition:

1st: Fighting 4 Freedom
2nd: Sublime
3rd: qlimaX – Livid

This year's CS event was hotly contested all day, but in the end Fighting 4 Freedom rose above the competition, taking home a tidy sum of cash as well as mess of hot ASUS gear. In fact, they went through the entire day undefeated! When you combine that with their undefeated run through the preliminary matches (**http://www.gamearena.com.au/competitions/wgt08-cstrike/standings.php**), they were always going to be the team to beat.

The Quake 4 comp was no less competitive:

1st: zeal0r
2nd: uNhoLeee
3rd hect1c

Zeal0r walked away with the Quake 4 cup, handily railing, plasmaing and generally pwning his way to victory. Warcraft III may have lacked the raw plasma, but it made up for that with some savage fighting on the day:

1st: Glade
2nd: Filthy
3rd: Bowt

Glade took home the top prize in an undefeated display of tactical skill, and more ASUS prizes to boot.

It was a day that showcased the best gaming talent that Australia has to offer, and ASUS and Atomic are already looking at ways to make next year's WGT the BEST event in the country.

Thanks to ASUS, of course, for sponsoring the event and being ever-generous with the prizes (and for flying interstate contestants to the event!), and mordain and lambo for running the competition for the last three months. Also, thanks to GameArena for hosting the initial heats and rounds.

In the word's of Team Immunity...

"Congratulations to all the teams who progressed through to the finals of the WGT and also to the organisers for a very professional and successful WGT 2008."

For more photos of LIVE and the WGT, be sure to check out **www.atomicmpc.com.au**

The action was frenetic all day.

Now that's a serious game-face! All the contestants fought hard to get to the final.

There are worse ways to pick up your own gaming skills than watching these guys at work.

Our brave event organisers... Lambo and Mordain!

... and were joined by uber-geek Adam Spencer for the final events and prizegiving!

The guys from Good Game called all the action from morning to close of day...

The WGT is a world class gaming event, with world class competitors.

Thanks to ASUS for supplying all the PCs and gear for the event!

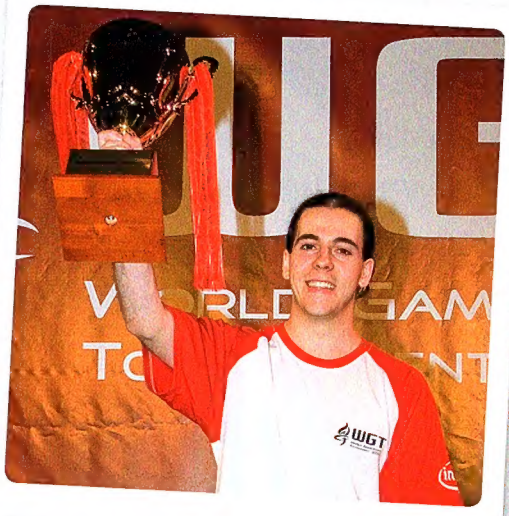
If they weren't playing, then they were scoping out the opposition.

Above: Fighting 4 Freedom ended up taking out first prize for the CounterStrike: Source competiton. They were unbeaten in the preliminary rounds, and on the day. Congrats!

All the winners walked away with top ASUS products.

The stands always had attentive game fans watching the best in the country battle it out.

All those metallic PCs and huge screens made quite an impressive sight.



Glade, winner of the Warcraft III tourney!

Congratulations to all the winners and qualifiers on the day. Their skill helps make LIVE great.

After the games were done, the crowd stayed to listen to Adam Spencer.

Ah... cosplay. Always hotly contested, always a lot of fun!

One of our forum superstars, CheekyChops, as a character from popular anime Deathnote.

Aussie Darth Vader. This got even worse...

The winner, Altair, from Assassin's Creed. Well done you pointy man, you!

"Harrgnhg! Harrngh-har-har haaaaaaaarngh!"

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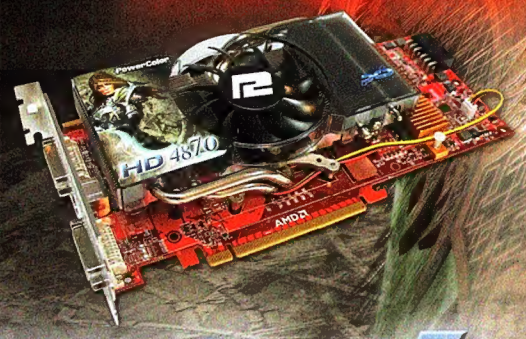

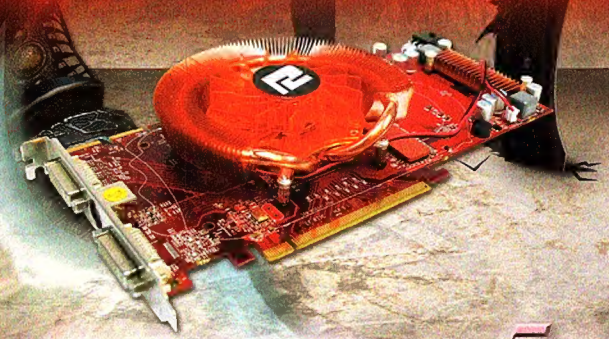

PCS HD 4870

Video Memory : 1GB / 512MB GDDR5
Engine Clock : 800MHz
Memory Clock : 950MHz (3.8Gbps)
Memory Interface : 256 bit
Bus Interface : PCI-E 2.0
DirectX Support : 10.1

PCS HD 4850

Video Memory : 1GB / 512MB GDDR3
Engine Clock : 665MHz
Memory Clock : 950MHz (1900MHz, 1GB)
993MHz (1986MHz, 512MB)
Memory Interface : 256 bit
Bus Interface : PCI-E 2.0
DirectX Support : 10.1

20°C+ PCS+

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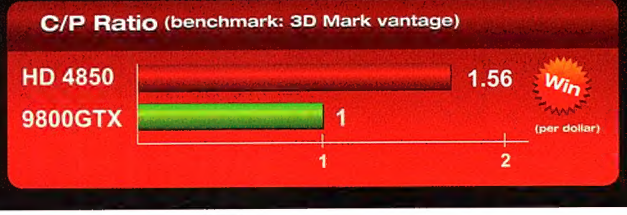

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